The Welding Engineer

NEER—BUSINESS AND TECHNICAL JOURNAL OF THE WELDING INDUSTRY

lume XXVI — April, 1941 — Number 4

APR 10 1941

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CU. FT. OXYGEN CONSUMED Per Lin. Ft. Cut	56.6	46.6	36.6	28.0	18.8	12.9	6.4	3.0	1.4	.93	.85	.56	.44	.40	.28
TORCH TRAVEL—In. Per Minute	3.0	3.4	4.0	5.0	5.6	6.8	8.4	10.4	10.4	14.2	14.2	14.2	15.8	17.4	19.6
WIDTH OF KERF	3/8	3/8	3/8	5/16	1/4	7/32	3/16	9/64	7/64	3/32	3/32	5/64	5/64	5/64	3/64

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★MAINTENANCE

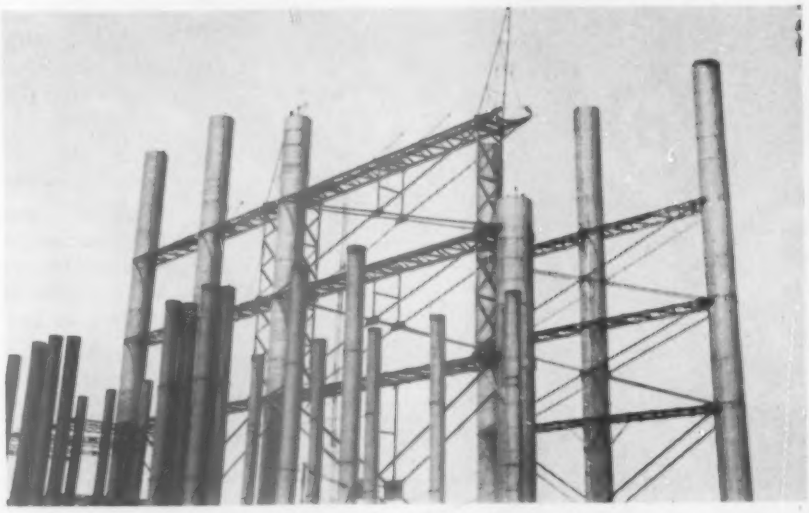


Fig. 1—Replacing the top 111 ft. of these seven 8 ft. 6 in. dia. stacks is the job at hand.

Alameda Steam Plant Stacks Reconditioned by Welding

By

CLAYTON M. ALLEN

Assistant Mechanical Engineer
Bureau of Light & Power
Los Angeles, Cal.

★ **Modern cutting and welding methods are constantly becoming more important for plant maintenance. These maintenance tools make possible many repairs with the minimum of expense and the minimum operation delays. There is described extensive repairs to seven power plant stacks.**

REPLACING one hundred tons of riveted steel stacks with new welded sections on the top 111 ft. of seven 200 ft. — 8 ft. 6 in inside diameter smoke stacks at the 70,000 kw. Alameda Steam Plant of the Los Angeles Bureau of Power and Light proved to be an unusual and interesting maintenance job, one not performed as regular routine work. The Alameda Steam Plant, with its seven reconstructed stacks, and twenty-eight smaller stacks, is located near the heart of Los Angeles, just on the outskirts of the business district.

The riveted stack, which was erected and placed in service in the fall of 1922, particularily the upper section, was found to be corroded on the inside of the plates as a result of gases formed from the products of combustion. Their original thickness had been reduced from 50% to 100%. This rusting action caused the lap joints of the old plates to expand leaving a ⅛ in. strip of corroded and rusted material between the plates for the entire ring of the lap. To check the condition of the stacks test holes had been drilled periodically through the plates to study the rate of corrosion and rust in the different parts of the stack. This practice resulted in the decision to replace the top portion of these stacks. During the plant shutdown the lower portion of the stack, which remained intact, was sand-blasted inside and painted inside and out.

This lower portion of the stack was not replaced for two reasons: First, the $\frac{5}{16}$ in. plate, as originally installed, was thicker than the middle and top ¼ in and $\frac{3}{16}$ in. sections respectively, and second; the deterioration had been less in this portion of the stack as it was closer to the boiler and not conducive to the severe corrosive action prevalent during low load and low heat conditions.

Before dismantling operations were started, careful studies were made and a plan of procedure adopted to insure continuity, smooth operation and safety during construction.

It was necessary to cut the structural steel stack bracing free from each stack as it was replaced, and temporary shoring was installed. The bottom of three horizontal stack bracing struts were detached from the sections of the

Fig. 2—A new welded stack section is lowered into place as the stack rebuilding operations begin.

stack to be replaced and attached to the top section of the old riveted stack that remained unchanged by diagonal angle iron braces. They were welded in position and remain as a part of the permanent structure. The temporary wood shoring which held the upper two horizontal struts in place during construction operations were located over the point where these diagonal iron braces joined the bottom horizontal strut, and was designed to carry all additional loads incident to construction activities.

Dismantling

The removal and transfer of stack guys was very carefully handled, particularly those transverse to each row of stacks. As the old stacks were disassembled by flame cutting, and the new stacks erected, the guys were transferred to and from the stacks and located as near to their permanent positions on the horizontal stack-supporting structures as possible.

In handling the top twenty-five feet of stack, a modified jenniwink fabricated from 2½ in. and 3 in. iron pipe was used, being supported by a platform suspended inside the stacks. The balance of the stack sections were handled by welded pipe "A" frames set on the top stack-supporting structure directly above the temporary wood shoring adjacent to each stack. All hoisting operations were carried on from temporary platforms erected on the power plant roof. The load lines going through "pass" holes cut in the stack or over the top of the stack using special fabricated steel sheave blocks which were attached to the stack at the "pass" hole or straddled the top.

Shop Welding

Seven sections of the 111 ft. of new stack were of ¼ in. plate, 8 ft. 0 in. high and eleven sections of $\frac{3}{16}$ in. plate, 5 ft. 0 in. high. The top five sections were fabricated in halves to facilitate erection. All stack sections were rolled from ASTM A-7-39 plate. Although the old stack sections were in 5 ft. heights, the increase to 8 ft. for the seven lower sections of the new stack reduced the cost of fabrication and erection. Joints on the new sections were butt strap type with butt welds inside and lap welds outside.

All shop welding was done by the shielded arc process with one pass using a back-up strap if machine welded, or two passes, if hand welded. All joints were specified to equal plate strength and welders were qualified under ASME code for unfired pressure vessels, Paragraph U 70, 1937 edition. Each circular section in the stack was fabricated with four 2½ in. x 2½ in. x $\frac{5}{16}$ in. Tee iron clips 3 in. long, temporary tack-welded on the inside of the top of each section with ¾ in. diameter hole drilled in the stem for use in handling, and for inside working scaffold hanger supports. A ⅛ in. spacer was welded to each clip to space the horizontal butt joint for field welding. The butt strap was 3 in. wide and was welded to the bottom part of the section so as to facilitate erection. All sections were sandblasted inside and out by the fabricator.

Field Welding

New sections of stack were hauled by truck to the yard adjacent to the plant and raised by an air hoist to the temporary platform. They were then rolled to positions beside the stacks for hoisting into place. Two working platforms were used inside of the stacks, one suspended below the

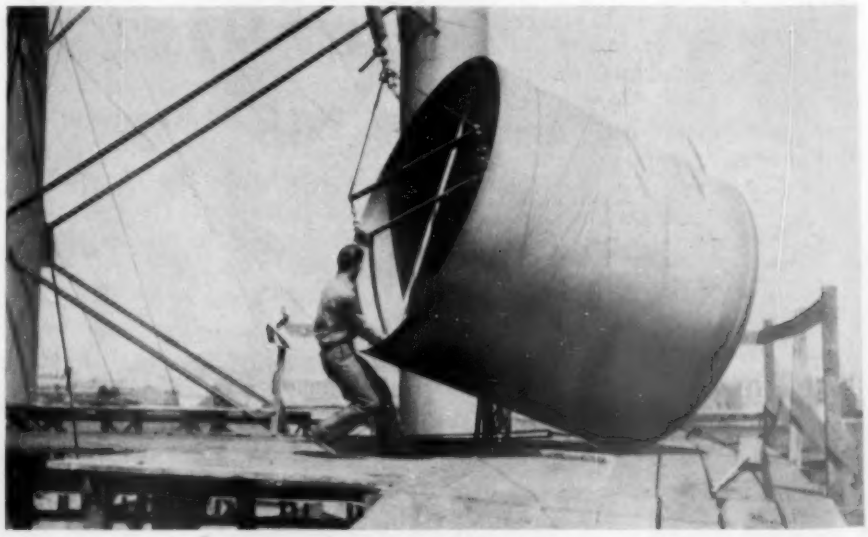


Fig. 3—Standing a stack section on end prior to hoisting into position. Note lifting bail, spreaders and temporary lugs.

Fig. 4—The cutting torch quickly dismantles the old riveted stacks. Note the corrosion.

other, with a manhole in the upper platform. The sections were set and tack-welded from the upper platform, and finish welded from the lower platform, thus expediting the work and minimizing plant shut down.

The field welding procedure was to tack-weld the butt joint inside and then completely fill with weld metal making a flush joint. The half sections were tack-welded together and to the lower section before completing the inside weld. After completing the inside welds, the outside vertical welds were made. The bottom of the butt strap was not welded. After being tack-welded so as to withstand the weight of the next one or two sections, the inside welding was carried forward during the day shift, thus eliminating overtime work, and at such times as did not interfere with the erection and placing of sections. A ⅜ in. x 3 in. ring was welded to the top section projecting ½ in. above the stack plate, for use as a permanent track for the tiller rope pulley.

More than ordinary interest to steel fabricators and the welding industry was the free and unlimited use of the cutting torch and electric welding as a tool in fabricating many gadgets in the field as well as for preparing and welding "U" bolts and hooks to stacks and structures at exactly the location for effective rigging, and in less time than it took to decide on such a location. Of importance is the fact that they were left in place for future rigging operations, with the exception of "pass" holes, over which cover plates were welded.

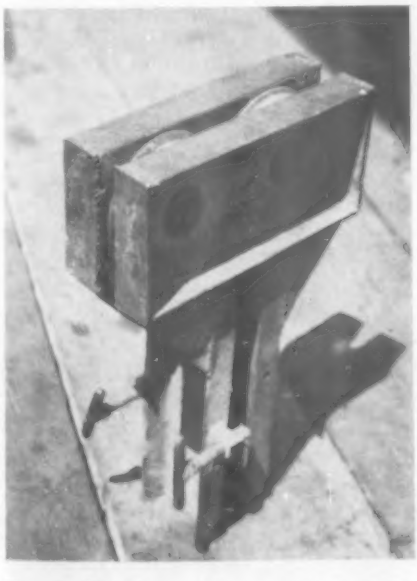


Fig. 5—Electric welding made possible the fabrication of special sheave blocks on the job. This one was used to take the hoist line over the top of the stack.

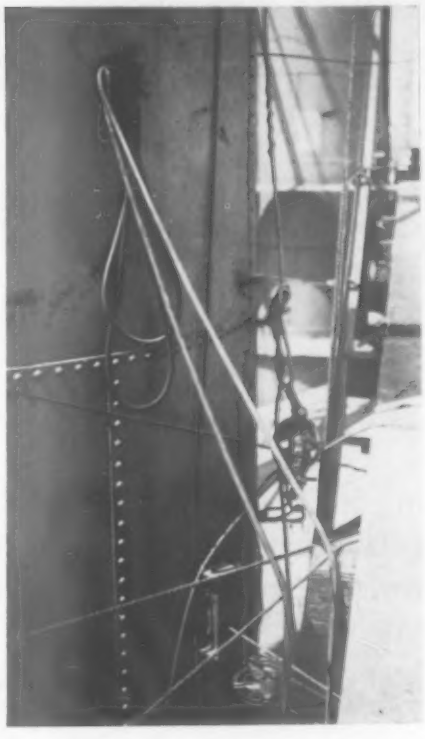


Fig. 6—The use of electric welding as a construction tool enables the rigger to make fastening to his best advantage.

A further and important use of welding was in sealing the top of all existing steel bands, which connect the structural steel stack-bracing to the new stacks, this was done to prevent moisture from getting between the bands and the stack, thus eliminating possibilities of corrosion. **THE END**

Michigan State Welding Conference

The First Annual Welding Conference to be held at Michigan State College, East Lansing, Mich., is to be sponsored jointly by the College and the Detroit Section, A.W.S. The two-day program follows:

Friday, April 25th 1941

9:00 A.M. Registration

9:30 A.M. Opening Session
- Address of Welcome—H. B. Dirks, Dean of Engineering, M.S.C.
- Reply—G. F. Jenks, President, AWS, or K. L. Hansen, 1st Vice-President, AWS.
- "Atomic Hydrogen Welding"—L. G. Pickhaver, General Electric Co.
- "Metallurgy of Weld Metal"—F. R. Hensel, P. R. Mallory Co.

12:30 - 1:45 P.M. Luncheon on Campus

2:00 P.M. National Defense Program
- "Electronic Controls" — E. H. Vedder, Westinghouse E. & M. Co.
- "Welding of Aluminum" —G. O. Hoglund, Aluminum Co. of America
- "Welding of Stainless Steels"—Speaker to be announced

5:30 P.M. Tour of Campus by Bus

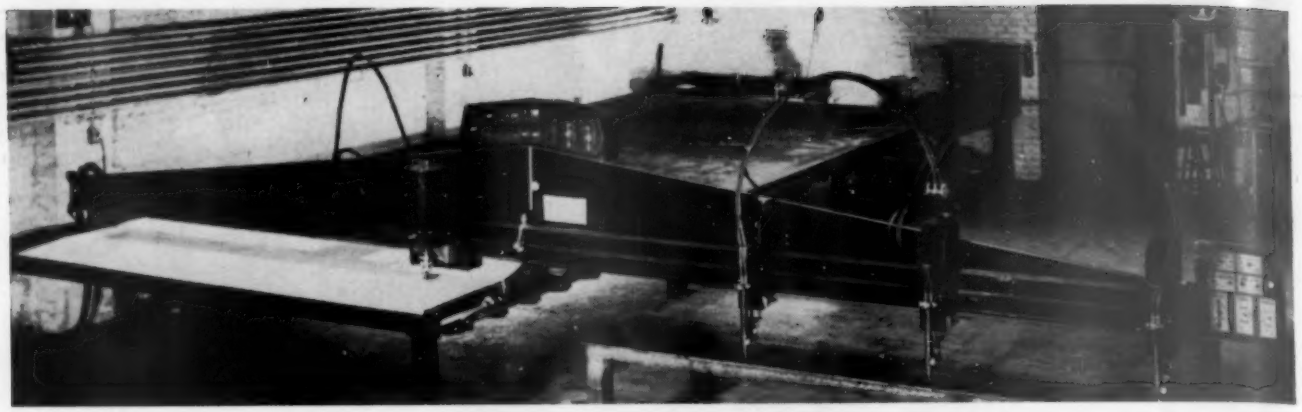
7:15 P.M. Dinner—Union Building
- Dinner Music by Pete Wheeler & His Orchestra
- Entertainment — M.S.C. Students
- Speaker—to be announced

Saturday, April 26th, 1941

9:30 A.M. Resistance Welding Session
- "Maintenance of Resistance Welding Machines & Electrodes" — G. N. Sieger, S-M-S Corp.
- "Stored Energy Resistance Welders & Their Place in the Defense Program" — S. M. Humphrey, Taylor-Winfield Corp.
- "Pulsation Welding" — H. C. Cogan, National Electric Welding Machines Co.

12:00 Noon Luncheon—Union Building

1:30 P.M. Afternoon session
- "Designing for Arc Welding"—H. C. Hettelsater, Harnischfeger Corp.
- "Flame Hardening & Strengthening" — R. F. Flood, Linde Air Products Co.
- "The Development of Welding in the Aircraft Industry" — Frank Smith, Stout Skycraft, Inc.



Square welded steel tubing form the structure of this giant cutting machine.

The Possibilities of Welded Tubing in Design*

★ Welded Tubing has many uses in industry. Some of these uses, the reason for their choice and the potential possibilities of welded tubing are described and applications are cited.

THE BASIC utility of the tubular member in design is the advantageous distribution of material it affords, which results in a high strength-weight ratio compared to other sections. The designer who makes use of this inherent property is merely following the example set by nature in building a structure with the least amount of material that is consistent with safety and efficiency.

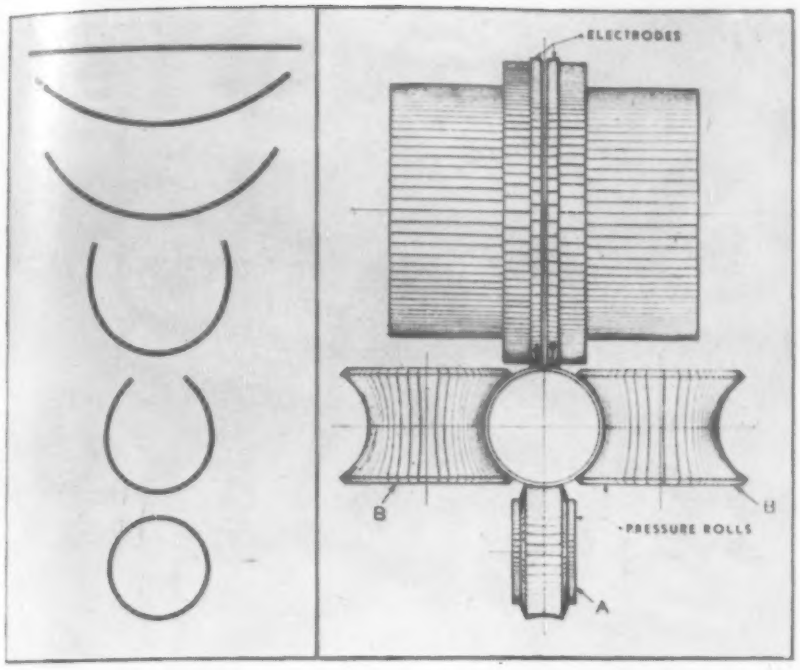
Among the earlier large-scale structural or mechanical uses of welded steel tubing are furniture and bicycles. More recently important applications have been made in the automotive parts field. These however, are only a few of the industries in which the tubular section is used to save weight without sacrificing strength. There are hundreds of applications that are equally as important but not so widely known. Not long ago one steel company announced the development of a tubular railway car axle said to be thirty per cent lighter, with twenty-seven per cent more capacity. A prominent automobile manufacturer has predicted that the car of the future will be made up largely of plastics and tubing.

Automotive Applications

At the present time the automotive industry uses a very large amount of the welded tubing that is produced in this country. Automotive engineers have found that welded tubing can be fabricated on a mass production basis as readily as any other material they use. It can be bent, expanded, tapered, beaded, flared, flanged and drawn and in many automotive purposes a single tubular part has been subjected to a combination of several of these operations. The layman, not familiar with tube fabricating operations, is likely to look upon tubing as a difficult material to handle. On the contrary practically anything can be done with tubing using the ordinary run-of-the-mill fabricating tools, often with much less difficulty than is involved in fabricating common structural shapes.

Large-scale use of tubing has been confined to relatively few industries, consequently, a study of its possible application in other industries furnishes an excellent field for research and for redesigning.

*Abstracted from a paper presented at Purdue University Welding Conference by H. S. Card, Director Product Development, Formed Steel Tube Institute.



On the left is pictured the six steps required for forming a round tube from a flat sheet. This operation is continuous. On the right is pictured the electrode arrangement for resistance welding tubing.

To many investigators it may seem that they are working with a new material, but this is not the case. The first electric welded tubing is said to have been produced in the year 1896 in Cleveland, Ohio, which would indicate that the art of making electric welded tubing is forty-five years old. The first oxy-acetylene welded tubing seems to have been made commercially in this country in 1912. The well-known Johnson Process for producing electric resistance welded steel tubing was patented in the early 1920's and is now used in the production of a very large share of the welded steel tubing that is being used today.

Manufacturing Process

The process of manufacturing welded steel tubing is one that requires an elaborate installation of high precision production equipment. Flat steel strip is fed continuously from coils through forming rolls which gradually shape it to the form of a circle. At the beginning of the operation the top and bottom forming rolls are opposite in contour but the final forming rolls are of the same contour top and bottom. From the forming rolls the butted tube is passed through the welding section of the machine. When the resistance process is used, the welding unit consists of a high amperage current supply connected to a pair of copper alloy disks which serve as electrodes and make contact with the two edges of the formed strip. When the tubing passes under the electrodes the current is automatically applied and travels from one electrode to another across the seam cleft, creating heat through the resistance offered to the flow of the current by the edge surfaces.

The moment the current is applied, the side rolls exert sufficient pressure to bring the edges together and form a welded joint. The material at the extreme edges of the butted joints having been heated somewhat beyond the plastic state is squeezed outward, and the union is made with unexposed metal which is in the plastic condition. No extra metal is added, the weld being a complete union of the butted edges. The manufacturing process results in a weld free from inclusions, oxides, overheated structures and similar defects, and one which has the same composition as the base metal.

The development and perfection of tube manufacturing processes has been going forward for many years. The fact that welded tubing now meets the rigid requirements and specifications of the automotive industry, that it is used in boilers, condensers and heat exchangers, and has been approved for use by the Army, the Navy and other government departments, is evidence of the progress which has been made in this field. As long ago as 1929 the National Bureau of Standards made a very searching investigation of the properties of electric resistance welded steel tubing which clearly established the integrity of the product. The results of these tests were reported in Research Paper No. 161, Bureau of Standards, April, 1930.

Advantages of Tubing

There are some inherent advantages in tubing that is made by the forming and welding of flat strip. One advantage is the obvious economy resulting from the few operations required for producing tube in the small and medium diameters with relatively thin wall; that is, thinner than standard pipe sizes of the same approximate diameter. Uniform wall thickness is easily obtained since the manufacture of the tubing starts with material already rolled to the desired wall thickness. If cold rolled strip is used very close tolerances in gauge are possible. Likewise, the tubing will have an excellent finish for polishing or lacquering and close control of temper or hardness may be secured. Due to the uniformity of wall thickness throughout the entire tube, the inside diameter and outside diameter are concentric. In many cases this feature permits the use of minimum gauges in a design with resultant savings in fabricating costs and in weight. In rotating parts this concentricity has the effect of eliminating whip and vibration of the member under load.

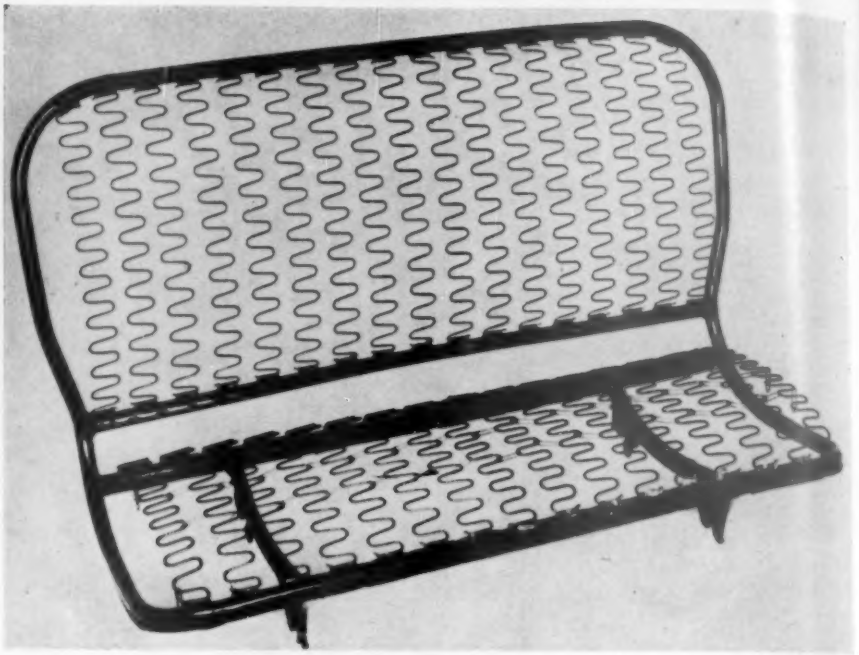
To suggest the design possibilities using welded steel tube members, a few examples of some of the less widely known applications will be discussed. In the automobile there are numerous places where tubing serves the purpose of flow lines as in mufflers, tail pipes, car heater tubes, ignition conduit, etc., and as seat frames. More exacting requirements are found in rear axle housings, propeller shaft tubes, torque tubes, drag links, brake shafts and frame supports.

A radical departure from conventional design appeared a few years ago with the introduction of a motor bus with the body frame

made ot square welded steel tubing. In this design the total weight of a 24 passenger bus coach was reduced to less than 6500 pounds. The frame unit itself weighed about 745 pounds. This weight reduction enabled the bus manufacturer to equip the coach with small, mass production power plants, axles, transmissions and clutches, gaining the advantage of lower initial cost as well as the availability of replacement parts at numerous branch service stations. In operation these coaches showed much longer wear on tires and brake linings. The records indicated a tire mileage of more than 60,000 miles per set of 6.50-20 tires. Similarly, gasoline mileage was more than twice that of heavier coaches of the same seating capacity. The material was 1¼-inch square welded tubing, and all of the frame joints were welded. All doubts about the performance of this construction in case of accident were cleared up when in the course of time one or two collisions demonstrated that this particular type of construction has a tendency to localize any such shock or impact, so that even less damage results than in the case of heavier construction.

Furniture Applications

The furniture industry has not been as quick as the automobile manufacturers in adapting tubing to their uses. Although a great deal of tubing already is used in the manufacture of furniture it has not obtained complete acceptance by the public because many people do not favor its appearance when the tubing is exposed to view. Somewhat limited success has been obtained in making overstuffed furniture with tubular frames. The automotive industry, however, has developed designs for this purpose to a very advanced degree. Wood frames for car seats are a thing of the past. Motor car makers have learned to make up tubular steel seat frames in standard forms and to cover them so artistically with upholstery that they rival in appearance the latest club chairs and davenports to be found in furniture displays. They have also developed new types of cushions which are far superior to the old-fashioned



This automobile seat frame pictures the manner in which tubing may be used to replace wood in furniture manufacture.

upholstery methods. There is enough difference in the different makes of cars to indicate to the furniture designer who wants to develop a line of lifetime furniture frames that he not lacking materials or production methods.

An entirely different type of application is found in a newly developed oxy-acetylene cutting machine. The structural parts of this machine are all made of square welded steel tubing. One of the structural elements is the table which carries the templates used as a cutting guide. The table legs and frame are likewise square steel tubes while the top is a comparatively thin steel sheet. The long carriage which supports the cutting torches and guiding head consists of a square tube truss and a crosshead beam built of two lengths of square tubing, a formed angle of ⅛-in. steel sheet and stiffeners of ¾-in. channels. The result is a lightweight, precisely built machine with maximum rigidity.

An example of a tubular structure suitable for dynamic loads is found in fabricated booms for truck cranes. When skillfully designed such booms show distinct advantages in rigidity and strength-weight ratio. One manufacturer has turned out more than 500 booms of tubular construction, in some cases using tubing throughout and in other cases using angle members for chords and tubular diagonals.

Tubing Readily Welded

The fact that the best joint between tubular members is a welded joint is in itself advantageous because since welding can be made to develop the full strength of material, the smallest sections can be used in design. Accurately formed joints are desirable for some applications, but in a great many cases a much simpler and more easily assembled joint is perfectly satisfactory. Also, there are numerous ways of making mechanical joints which are especially desirable when there is need for occasional dis-assembling or adjustment. The necessary operations of cutting and forming can be done mostly with standard shop equipment. In general, they can be done just as rapidly and economically as similar operations can be performed on other sections.

The designer who wants to get the maximum utility from the tubular section will make a careful study of it to determine its full possibilities and then visualize methods of bringing out all of its advantages in his design. He will then find that it is a comparatively simple matter to determine the best procedures for cutting, forming, fabricating and assembling the tubular parts into a complete unit.

THE END

★ SAFETY

Fire Extinguishers and Their Maintenance

By
LEONARD F. MAAR
Safety Research Institute

★ Increasing industrial activity and acts of sabotage are resulting in greater fire hazards in industry. To reduce these risks knowledge of fire control, fire extinguishers and their maintenance is essential.

IT HAS become standard practice in many industrial plants to safeguard welding, cutting and similar operations by keeping men on guard armed with fire extinguishers. Therefore it is important that these fire guards understand the types of equipment needed to protect the hazards involved and that they know how the equipment is maintained in service.

The danger in many manufacturing operations is that sparks and bits of molten metal may travel some distance from the work and come in contact with a combustible or inflammable material. If this happens, almost any class of fire may occur, depending upon the exposures in that particular location. If dip tanks containing finishing enamels or other flammable finishes are exposed, the fire guards must be equipped with extinguishers capable of handling the class of fire that may be anticipated. For this reason, the plant fire chief, or whoever supervises and issues permits for welding jobs, should provide the fire guards with extinguishers of suitable types.

There are three classes of fire and each involves different principles of extinguishment. Fires in ordinary combustible materials such as wood, paper, textiles, rubbish, etc., are known as Class A fires. Fires in flammable liquids, such as gasoline, oils, solvents, paints, lacquers, etc., are known as Class B fires and they must be blanketed and smothered to exclude oxygen from the flames. Water is likely to spread such a fire by splashing the burning liquid. Class C fires are those in live electrical equipment where a non-conducting extinguishing agent is necessary.

There is no one type of extinguisher approved by the fire underwriters for use on all three classes of fire. The types recommended for each class of fire, follow:

Class A fires—soda-acid, foam, loaded stream, anti-freeze solution, water types are approved. The vaporizing liquid type is recommended for fires of this class that are not deep-seated in the burning material.

Class B fires — foam, loaded stream, vaporizing liquid and carbon dioxide types.

Class C fires—vaporizing liquid and carbon dioxide types.

The proper maintenance of this equipment is important. Each extinguisher bears an instruction plate on which are given full directions for recharging or inspecting and these directions should be followed to the letter. Recharging materials or replacement parts should be obtained from the manufacturer.

Fire extinguisher "bookkeeping" is a simple matter, but very important. On the tag which is wired to each unit, the name of the man doing the recharging and the date are written. Thus it is easy for inspectors to check these important details, and learn when recharging will be necessary in the future.

The 2½-gallon units should be washed out with warm water before being recharged, and the water drained through the hose. The strainer should be cleaned. Hose and gasket should be inspected and replaced if signs of deterioration are found. Inspect the seams of the container and, if signs of weakness are found, have the extinguisher tested hydrostatically by a competent service man or by the manufacturer. Never try to solder leaks.

When replacing the head on the extinguisher a small amount of vaseline may be placed in the threads. This will make the job easier and facilitate removal of the head the next time the unit is recharged or inspected. At least four threads should be engaged when screwing the head back on the shell.

Long experience has shown that the simplest and best means of keeping a record of the date of recharging or inspection is by noting the date and the name of the person doing the work on the tag furnished with each extinguisher. Some manufacturers furnish a new tag with each package of recharging materials.

Instructions for recharging and inspecting the various types of extinguishers follow:

Soda-Acid — Recharge annually. Dissolve powdered chemical thoroughly in lukewarm water in a container—not inside the extinguisher. Fill to filling mark. Remove cork from acid bottle and replace it with stopple before placing bottle in cage. At temperatures below 40 degrees F., units of this type need protection in suitably heated cabinets.

Foam—Recharge annually, dissolving the chemicals in water outside the extinguisher, and, if the same container is used for the two solutions, rinse it carefully each time it is used. Use hot water for dissolving the A, or acid charge, and lukewarm water for the B, or foaming agent. Where temperatures of less than 40 degrees F, are encountered, foam units need to be protected in suitably heated cabinets. Anti-freeze ingredients can not be used in foam extinguishers.

Vaporizing Liquid — Recharge after use and keep filled at all times. Test the action of the pump by pumping some of the liquid into a clean, dry container. The liquid can be returned to the unit through the filler opening. Add enough liquid to bring level to normal. Guard against over-filling. No lubrication is used on the piston of this type of extinguisher. Never use water to test the extinguisher nor should a commercial grade of carbon tetrachloride, since it may contain water or chemical impurities, be used. If the extinguisher is of the stored pressure type, a gauge reveals air pressure and a glass port or peep sight shows the level of the liquid. It may be tested by discharging some of the liquid, which can be restored to the extinguisher and the air pressure replenished.

Loaded Stream — Recharge after use and inspect annually. Weigh the gas cylinder. Loss of one-half ounce in weight is cause for replacing it with a new one. Note if filled to filling mark. When recharging, the chemical, if not obtained in solution, should be dissolved outside the extinguisher.

Carbon Dioxide — Recharge after use. Inspect annually to see if seal attached to the operating valve is intact. Weigh the unit, according to the directions on it, to make certain the weight equals that stamped on the unit. Loss of ten per cent in weight indicates need for recharging.

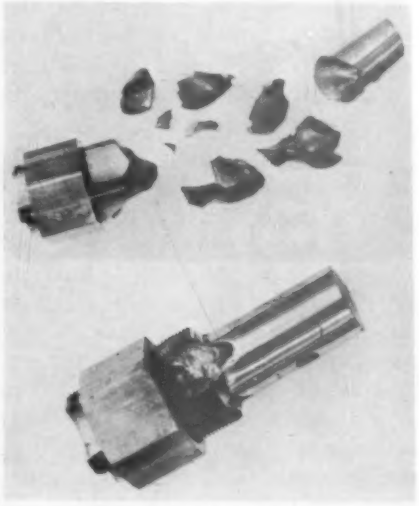
Anti-Freeze Solution — Recharge all types immediately after use and inspect them annually. If of pump-action type, test the pump by operating it for several strokes, discharging the solution back into the tank. A drop of thin lubricating oil may be placed on the piston rod packing. If carbon dioxide is used for pressure, the gas container should be removed and weighed to detect leakage. Loss of one-half ounce in weight is cause for replacing the gas container with a new one. Note if extinguishers are filled to filling mark and replace any of the solution that has evaporated. Anti-freeze crystals also should be dissolved outside the extinguisher.

THE END

A Fast Tap Repair

In a large mid-west plant a special 1⅜ in. tap was shattered in service. It broke in ten pieces of various sizes and shapes and threatened to tie up production on an important job. A check-up with tool manufacturers broought the advice that a new one could not be delivered for six weeks so the tool maintenance department decided to attempt a repair.

The head of this department, familiar with high speed steels, knew that welding was impossible but had a hunch that low temperature silver brazing alloys might do the trick. He had all parts cleaned carefully and fluxed with a low temperature flux. Parts were then assembled and held closely together in a milling machine vice. Heating was done with an oxyacetylene torch and a medium silver alloy flowing freely at 1175 Deg. F. was used to make the repair. The exceptional penetrating qualities of this alloy, it was felt, would let it flow throughout the many surfaces that had to be joined.



A 1⅜" Tap, which was broken in ten pieces (upper) was readily repaired by silver brazing (lower). (Photo Handy & Harman.)

How well this repair was completed can be judged by the fact that the tap was back in service in four hours. That was last October. A report dated January 11, 1941 states that the tap is still in use. The actual brazing time for this job was but ½ hour and but 3" of ⅛" diameter of alloy wire was used to make the repair. The only fault detected after brazing was that the tap is .005" out of center, which made no great difference on the particular work being done. The job proved conclusively, however, that a braze of this type gives plenty of strength to withstand severe service conditions.

★ ALLOYS

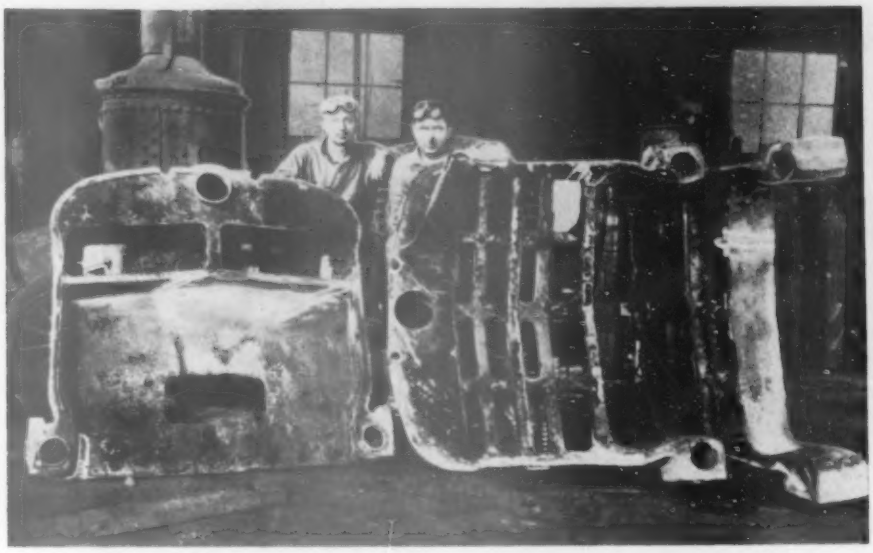


Fig. 4—Cracked boiler sections are brazed with a minimum of delay.

Brazing—a Tool for Plant Maintenance

By
W. S. WALKER
Manager of Process Service
Linde Air Products Co.

★ Part 2 — Most ferrous and non-ferrous metals can be joined readily by brazing. This factor has resulted in the adoption of brazing as a major maintenance tool in many industries. In this article there is cited some of the possibilities of this versatile welding process.

HARDLY a day passes in the average plant, regardless of size or industry, where brazing cannot be of considerable service. These uses can be classified under three general headings—repair of fractured sections, bronze-surfacing worn parts, and fabrication of plant equipment.

Repair

Foremost among repair tasks that bronze-welding is called upon to perform is the salvage of castings which through long service or by reason of accidents have been cracked or broken. Castings which form a vital part of plant equipment, such as furnace sections, machine bases, pump and boiler sections, bearings, cylinders, housings, valve bodies, gears, and machinery parts can often be restored in no other manner. That they may be easily and successfully repaired by brazing means considerable savings in replacement charges and often time saved when otherwise there might be a long delay waiting for a new part. The all-purpose bronze rod with its tensile strength of about 60,000 lb. per sq. in. and ductility in excess of 30 per cent, greatly exceeds the tensile strength and ductility of cast iron. The rod metal bonds very well with cast iron; the bond in fact, if properly made, being strong enough to pull cast iron away with it if a joint is tested to destruction.

Another factor that has led to the widespread popularity of bronze-welding for this repair purpose is that a brazed casting is better adapted to withstand the incidental overstress of shock than a solid, unbroken casting. The reason for this lies in the ductility of the bronze weld metal which permits the bronze to absorb shock or strain much better than cast iron itself. A brazed casting might therefore be considered as having been provided with a "shock-absorber."

There are, practically speaking, few limitations imposed by the type, service, shape, or size of parts to be repaired by bronze-welding. Several service factors do, however, impose certain restrictions which must be taken into

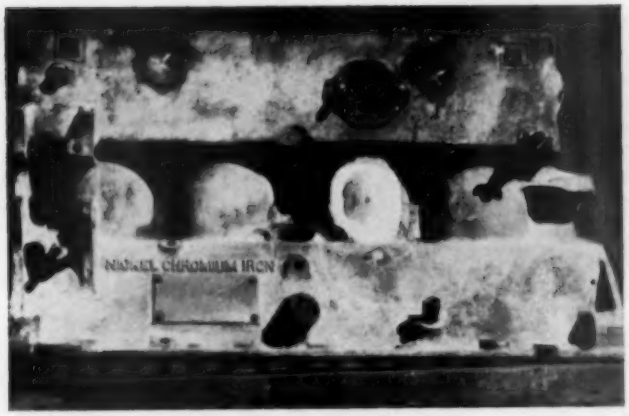


Fig. 5 — Alloy cast irons, as is evidenced by this successfully repaired chromium-nickel iron cylinder block, are readily brazed.

account. Where parts operate at temperatures above 500 deg. F., fusion welding should be used in place of brazing, since, bronze begins to lose strength rapidly above that point. Then, too, in certain chemical processes, materials may be used which do not affect the base metal but which would attack bronze. Strong alkaline solutions are typical. In these cases, fusion welding should be employed. There is a third service factor that restricts the use of brazing. It is important to remember that welding is not recommended for such parts as large high-speed flywheels or large fast moving reciprocating drive arms used on power equipment, which might by breaking cause widespread damage. In this case due to safety factors involved, such parts if broken should be replaced with new ones. Low-speed engine wheels or arms, however, may be brazed satisfactorily.

Pieces Away Shape Repaired

The shape of the part to be welded imposes no limitations upon the effectiveness of brazing. Cast iron is cast in some very intricate shapes but it is hard to conceive of any more intricate than a gasoline engine block. Yet this is one of the major applications of brazing with literally thousands of repairs by this process each year. The repair of another relatively complicated shape, quite often encountered in plant maintenance, is cracked furnace sections. The sections, shown in Fig. 1, were readily brazed and returned to service with a minimum of delay. The success with which alloy castings can be brazed is indicated by the frequent repair of engine blocks. The fact that the composition of the engine block shown in Fig. 5 consisted of chromium, nickel, and iron presented no problem. In fact, it represents many similar uses of brazing as a ready method of welding alloy castings.

Size No Limitation

Size places no limitations on the repair of cast iron parts. It affects only the need for attention to certain contributing factors when preparing, preheating and welding. Obviously the larger and bulkier the part, the more of a job it is to repair; but it is equally true that it would be more expensive to replace. Consequently proportionately greater savings can be made by repairing by means of brazing.

Fig. 6—This fire damaged 17½ ton cotton press frame was repaired at a great saving.

In going over the records of hundreds of jobs, many are outstanding because of size. One job pertained to a huge cotton bailing compress that had been badly damaged by fire. Three of the main castings of the compress weighed about 25½ tons. The largest, which was the main base of the machine, weighed 17½ tons; the two other, press guides, weighed 4 tons each. Extensive fractures had occurred but by following the regular procedure for preparation, preheating, welding, and cooling they were all brazed satisfactorily. Over 300 lb. of bronze rod was used. Three days' work netted the plant management a saving of at least $2,500 on the largest casting and proportional savings on the two smaller parts which weighed 4 tons each.

There are of course literally hundreds of small parts, made of cast iron and other metals, which when broken, can readily be restored by brazing. In Fig. 8 can be seen a representative lot of miscellaneous parts that the maintenance shop of a textile plant was called upon to repair over a short period of time. This calls to mind an interesting system of replacement which results in a minimum inventory of such machinery parts. As soon as a part is worn or broken it is replaced by a duplicate from stock. The damaged part is sent to the repair shop, repaired and then placed in the parts stock to await its turn in replacing another worn or broken part. Thus the cycle is repeated time after time and the mill's investment in parts is kept at a low figure. Brazing for repair of course, is not restricted to cast iron. While the repair of cast iron is the most common use of brazing about the average plant, this fact is due to the widespread use of cast iron and not to any difficulty that other metals present.

Bronze-Surfacing

Even more inevitable a problem than breakage about an industrial plant, is the problem of countering wear in moving parts or in surfaces

Fig. 7—A breach 10 in. wide, 15 in. high, and 4 in. thick in the wall of this cast iron hydraulic.

that come in contact with moving parts. Tailor-made for this work is a development of brazing known as "bronze-surfacing" which employs the same basic technique and rod but differs from brazing in that it is employed not to join broken parts but only as a means of adding metal to worn surfaces. This "building-up" process by bronze-surfacing has countless uses for plant maintenance. The free flowing qualities of bronze rod enables it to be applied as a thin coating or to be used in building up comparatively thick sections of homogeneous metal. The deposit of bronze weld metal is readily machinable which means it can readily be ground or machined to the desired dimensions after application.

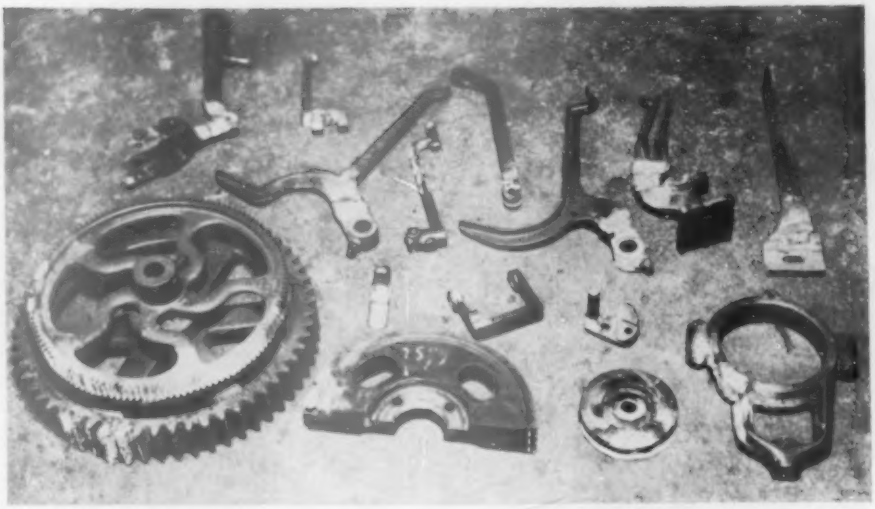


Fig. 8—These miscellaneous parts repaired by brazing in a textile plant represent a saving alone of $85.00.

Replaces Wear

Bronze-surfacing can be used in many places where it is advantageous to have the bronze carrying a load or withstanding simple chemical reactions of the product being handled. The friction of bronze on steel is materially less than that of steel on steel and the bronze is particularly adapted by toughness to withstand the wear of moving parts. However, where resistance to severe abrasion is desired, "hard-facing," which employs a regular hard-facing alloy rod, is the method to be preferred.

It is important that bronze-surfacing not be applied more than once to a steel surface that is subject to severe alternating stresses. When this occurs, penetration of bronze into the steel, commonly called cracking, may result. This intergranular cracking does not, however, occur on cast iron and consequently bronze can be re-applied on this material as often as desired.

Where worn cast iron or steel parts are to be refitted, bronze-surfacing serves a very useful purpose of rebuilding the surface, followed by machining to give the desired dimensions. Work of this kind is carried out in the building-up of pistons for reciprocating engines, and such places as pump linings where erosion has materially reduced the wall thickness. Such repair jobs are generally better than the original because of the characteristics mentioned previously—the resistance of the bronze against wear and abrasion.

Applications of bronze-surfacing are numerous. They include the rebuilding of such parts that are subject to wear in service as pistons, rotary valves, guides, and other moving surfaces of pumps, engine and machinery parts. Brazing is equally useful for another operation that comes in the category of bronze-surfacing—the rebuilding of missing or worn parts, such as gear teeth or valve disks and seats.

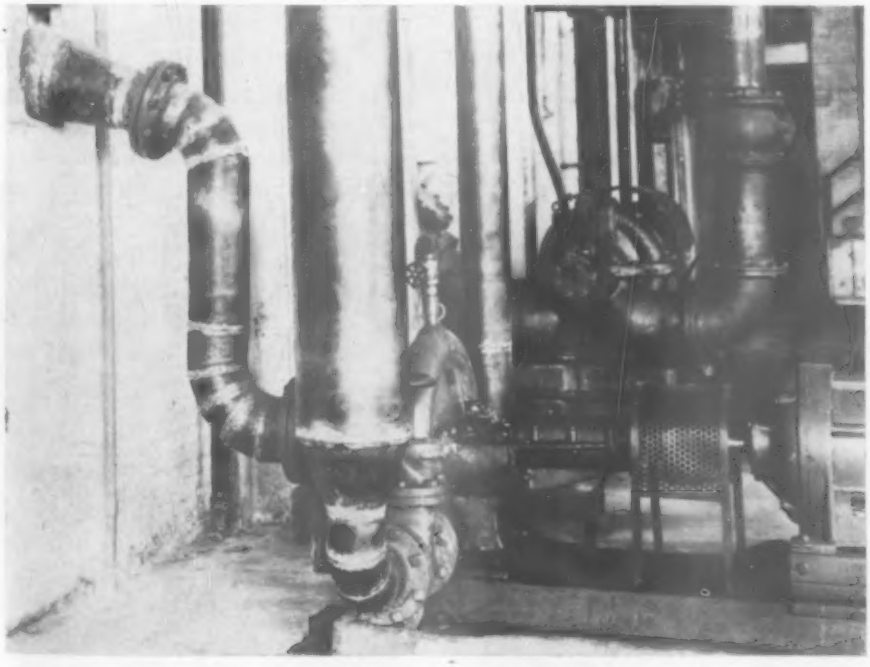


Fig. 9—Brazing for the fabrication of special copper fittings and the joining of copper pipe is standard in this plant.

Fabrication

The usefulness of brazing by no means stops with repair and maintenance work. It is expertly equipped for a host of simple fabricating jobs that plant maintenance departments are frequently called upon to perform. These include the installation of pipe lines and the fabrication of useful plant equipment such as stock racks, railings, machine guides and guards, and considerable equipment for materials handling. Such plant equipment can be made quickly and profitably from angle iron, scrap pipe, and sheet metal.

THE END

If a man could have half his wishes he would double his trouble.—*Ben Franklin*

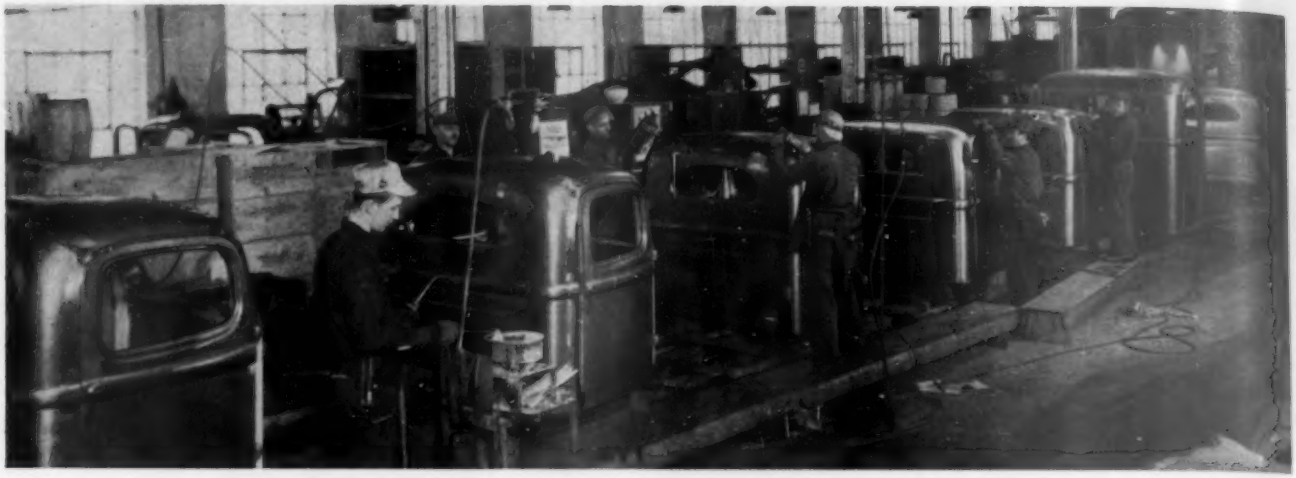


Fig. 1—A view of the cab assembly line picturing soldering and sanding operations.

All Welded Construction for White Truck Cabs

★ A modern motor truck builder uses three different welding processes in the building of a truck cab. Resistance, Electric and Gas welding processes each serve a definite purpose and each play an important part along the cab assembly line.

HANDCRAFTSMANSHIP is combined with modern tools and the assembly line technique to produce high quality cabs on a steady production schedule at The White Motor Co. plant in Cleveland. Today White operations are proceeding smoothly and cabs designed for all Super Power models, including both conventional and cab-over-engine types, are coming off the new line. Only craftsmen of long experience in body building are employed, and extreme care is exercised from start to finish. Emphasis is placed on thorough inspection is apparent from receipt of raw materials to the final seal of approval. A trip along the line will expose something of the manufacturing methods and the quality of cab produced.

To begin with, all parts are fabricated within the White plant with the exception of the large steel panels which are made outside with White-owned dies. Except for the preliminary framing operations, accomplished on a major assembly fixture, work is done at various stations along a floor-type chain conveyor line which has a variable speed of from 6 in. to 18 in. per minute. Cabs are spaced on this line about every 8 feet. Many types of craftsmen are required during the building process including spot welders, arc welders, gas welders, panelers, torch solderers, metal finishers, door hangers, painters, fit-out men and trimmers.

All panels, with the exception of flooring, are of 18-gauge steel—heavier than used by many builders. The incoming material is inspected according to pre-determined standards, and finished according to B/P specifications.

At the first point of assembly, the upper and lower back panels are combined by spot welding along the flanges at close intervals. Two men work together, positioning the unit and operating the foot pedal of the resistance welder.

At the second assembly station, the roof panel and windshield panels are combined by gas welding all the way across. This is done over a special form jig.

At the third assembly point, the completed roof and back panel unit are placed in a major assembly fixture and combined by electric arc welding, a welder and helper working together. Here, too, the cab shell is attached to the skeleton framework by arc welding, and the all-steel understructure is likewise combined by welding. The understructure itself is made of a 16-gauge panel welded to ⅛ in. channel supports. The floor panel is a one-piece stamping made at the White plant and fully insulated underneath with ½-inch wool for

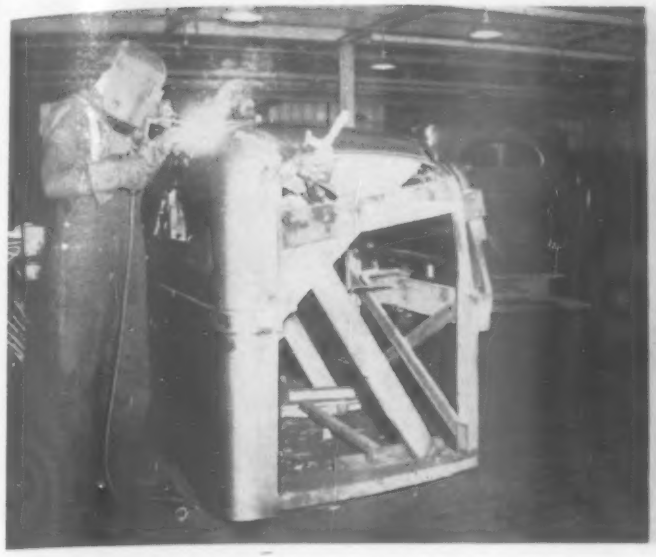


Fig. 2—Welding Roof Panels to the Rear Panel.

Fig. 3—Removing steel sheet from jig.

protection of cab occupants against heat or cold.

Conveyor Line Production

After these framing operations the cabs go onto the conveyor line. They are torch soldered to fill all seams, one man working on each side. The cabs are then completely metal finished, using sanding belt, disc wheel and hand sandpaper. No putty whatever is employed. The cabs are washed with acid and thinner, preparing the metal for the paint, with full assurance that no rust will eat through later.

The next operation involves the installation of patented seats, one on each side of the cab. The seat frames are of welded construction of tubular rail steel, centrally suspended above the cab floor on heavy alloy-steel coil springs which eliminate the jar of rough road surfaces. The frames are given one coat of prime and one of enamel.

Fig. 4—The Cab-Over-Engine type Truck Cab.

Each frame is supported by two steel arms, known as "ride controls," attached to the rear cab support, and mounted on rubber bushings which act as shock absorbers to control and prevent excessive bouncing. The tension of these bushings can be regulated to meet the weight of each individual driver, thus providing tailored comfort. The seat frames are also fastened to the cab uprights by shackles to hold the seat in a vertical position. This construction gives the entire seat assembly a cradle effect, which smooths out the ride for the driver. To further improve the riding qualities, regular shock absorbers are installed.

Particular pains are taken in hanging the doors, to make them decidedly serviceable as well as nice in appearance. They are thoroughly tested to see that the door action is free. In fact, they must be as easy to operate as the doors of a passenger car.

After a thorough cleaning, the cabs go to the prime spray booth for three successive coats of prime on the outside and one on the interior. Thence the conveyor line takes them through an oven where they are baked for 50 minutes at 225 deg. F.

After the baking the cabs are sanded to a satin finish. The conveyor line then makes a horseshoe turn and brings the cabs back through a finish spray booth, where they are given three coats of finish enamel, and through the other side of the oven where they are again baked for 50 minutes at 225 deg.

As the cabs come from the final baking, one man installs the windshield while others install the hardware, inside door panels, moldings, glass, upholstery and lining. The windshield is set in dumdum with rubber molding overlapping for full seal. Tubular rubber lace is employed all around the door to keep the draft out, and the door itself is rimmed with rubber strip to insure against air and moisture. All cabs are water tested.

All Welded Construction

Wool insulation is cemented on the inside surface of all top and back panels, cement for the purpose being sprayed on. On all cab-over-engine models, the engine housing is also insulated. Every cab is completely lined with trim fabric. Seats are upholstered in genuine leather with sponge rubber for foundation. The cushions themselves have three adjustments to suit the driver and the seat backs have four angular adjustments.

These cabs are air-conditioned, employing a roof-type air intake and exhaust system, and two adjustable ventilators in the front panel. Through these two inside doors the air flow is easily regulated. On COE models there is a cowl corner ventilator in addition to the roof ventilator. The cabs as above described, are strongly welded and entirely free from rivets. The manufacturing procedure by which they are made has proved efficient. Latest labor

Fig. 5—Installing welded tubular "Floating Ride" seat frames.

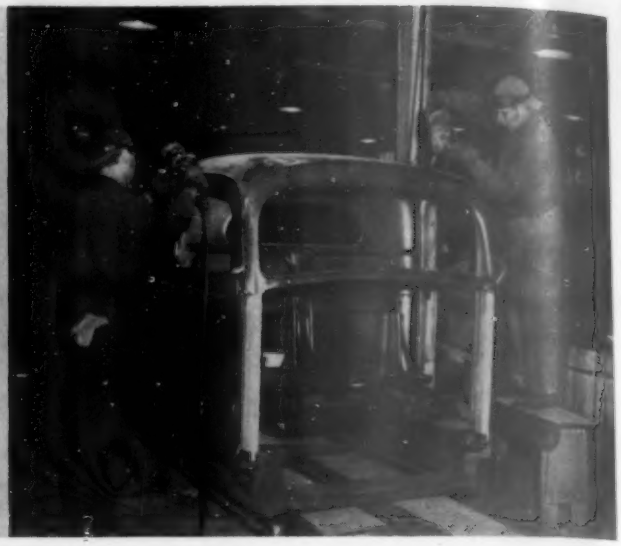


Fig. 6—Metal Finishing

saving devices consistent with good production methods are used along the line. Thus, electric drills, screw drivers, belt sanders and disc sanders are employed. Small pneumatic drills weighing less than two pounds offer distinct advantages on the interior of cabs because of their accessibility in close quarters. They are used almost exclusively on the fit-out and trim section of the line.

The rigid inspection maintained not only includes incoming materials but constant scrutiny all along the line. All functional parts such as doors and window regulators are given particular attention before the cabs are finally delivered to the chassis erection line.

Approximately 22 man hours are required for the production of a conventional cab, including fabrication of the various parts. The ratio of production is about 7 conventional type cabs to 1 COE. Production, of course, varies with the number of men and the speed of the line. Close control is exercised and not over 30 cabs are ever between the end of the cab line and the point of useage at the chassis erection line. At the present time a cab is produced every seven minutes ready for installation on the chassis.

To a casual observer this manufacturing process involves but two types of cab—the conventional and the cab-over-engine, but, in reality, there are built at least 300 different combinations of cab depending upon customer demand and state regulation. For instance, in addition to the different types and sizes, there are the different colors available, different marker lights, different seat possibilities from the single to the three man seat, glass variations including sheet and plate combination or double plate, floor board variations, rear window variations, and all the accessory choices. When you multiply the possible combinations for conventional and COE, in gas or Diesel engine application, the complexity of the production schedule may be ascertained. Especially when you consider that, with the COE, numerous truck specifications are definitely tied into the construction of the cab. All this does not take into account the cabs built for military purposes. In some cases sectionalized cabs are contracted for export, so that they may be shipped by plane.

Regardless of the specification variations, it may be said that the completed White cab is a streamlined job, fully insulated against heat, cold and noise, air-conditioned for comfort, and finished to suit the most exacting operator. In short, it presents passenger car smoothness with the ruggedness demanded in a truck. Effective welding technique has produced a cab entirely free from rivets—a solid unit in which there can be no shucking of joints or loosening of parts in frame or shell. While time and expense are considered, there is no sacrificing of quality in the crafting of White cabs. Built by experts, they must uphold the same level of reputation enjoyed by the famous White Super Power engines and the rugged frames which go to make up the complete White truck.

THE END

Fig. 7—The conventional truck cab.

Some Welding Thoughts of the Day...

Control and Inspection of Structural Welding

LE MOTTE GROVER
Air Production Sales Co.

UNDUE emphasis has been given to the lack of a positive, non-destructive test for welded joints and connections and likewise to the "human factor." A number of years ago when reliable procedures for welding had not yet been standardized and there were few properly trained and skilled welding operators available, such great concern was well justified.

Too many structural engineers, knowing practically nothing about welding simply marked a connection "weld," when they had occasion to use welding, and they relied upon the welding operator in the shop to work out all the details. Even the shop superintendent and foreman were inclined to delegate full authority for all details of welding procedure to the individual operator. Naturally this did not meet with success because such responsibility cannot be delegated to the individual workman in any kind of industry regardless of how highly skilled he may be in the manipulation of his tools and equipment.

When difficulties were encountered the "human factor" was blamed and it was deplored that a non-destructive test was not available to make up for the lack of intelligent engineering control and supervision of the work and lack of training for the operators.

All this has changed now. Through extensive research and experience, welding engineers and technicians have been able to set up rules and provisions for design and welding procedure that will assure reliable welds. They have learned how a welding operator can be trained within a comparatively few weeks to make a better workman then some of them have become through ten years or more of unguided experience.

Shop superintendents have found that economy suffers as much as quality of work from lack of proper supervision on their part, and they have come to organize and control the welding in their shops so as to produce reliable results. They have set up training schools in their own shops to develop new skilled operators as they are needed.

With adequate engineering inspection, such as should be provided for any construction operation, and with effective tests for qualifying welding operators, such as we now have, there is no more need for a non-destructive test for welding than when other construction methods are used. In no other type of construction —— concrete, timber or other materials, is there a practical non-destructive test in use for finished structural members or connections, despite the misplaced confidence that has been given to the traditional rivet-tapping test.

The representation that is occasionally made, of a need for meticulous and continuous inspection of the work of every operator, has discouraged some engineers from using welding. Competent engineering inspection is very important for welded construction but those in responsible charge soon find that continuous individual inspection is entirely unnecessary. Most of the welding on a structure can be adequately covered by visual inspection of the completed welds and an occasional inspection and check up on each operator, to see that he understands the procedure to be followed and that suitable provisions are made for his convenience, and to make sure that he is in proper physical condition to do his work; also to see that specification provisions are enforced such as cleaning of the steel and the finished welds. Nearly all welding operators will be found to be honest and conscientious about their work.

One of the most important duties of the engineering inspector is to see that the contractor has his work properly organized and planned in advance to provide conditions that will enable the operator to do good work, and, of course, to make sure that every operator has been adequately qualified.

In almost all fabricating operations the shop personnel must possess a resourcefulness to work out each problem and to supply certain details of operating technique that cannot be expressed precisely in procedure or specifications. However, the costly experimentation by trial and error that once prevailed in solving problems of welding procedure and control of shrinkage and distortion, has now given way in the properly organized and intelligently managed shop, to a system of rational control based upon standardized procedure and fundamental principles that have been proved to produce reliable results.

» «

Let's Overcome Conservative Pride

J. F. LINCOLN
Lincoln Electric Co.

ARC WELDING can easily take care of its enemies if it can only be delivered from the machinations of its friends.

Arc welding progress is being held back much more by people who could know the facts and will not than by all the people who condemn it from ignorance. This is a unique situation.

This fatherly criticism has condemned the consumer of welded products to the loss of many welding economies. It has also forced the would-be user to antiquated methods which are less reliable and more dangerous. The reasoning of these fatherly critics is that since no one can see into a welded joint therefore it should not be used. However, this same critic does not hesitate to use steel which, without question, is equally dense and much more variable in quality.

It is a peculiar quirk of human nature that the average man hesi-

tates in adopting new ideas. This perhaps is a very admirable trait. The consumer, however, by this same conservatism is condemned to paying more for an inferior article. Many millions of dollars of loss is incurred by him yearly because of the same conservatism. This loss can be justified for a proper trial period but not longer. This proper trial period expired many years ago.

It is time that we overcome this truly American trait in which we take so much pride. We should not allow this economic loss to continue merely because of our ideas of conservatism. After all, these conservatives do not pay the bill. That is paid by the consumer who wants progress and safety. He is tired of paying for Tacoma bridges which, if designed for welding, would have cost less and still be standing. He wants the economy and safety of a homogeneous structure which only welding gives and he wants it now.

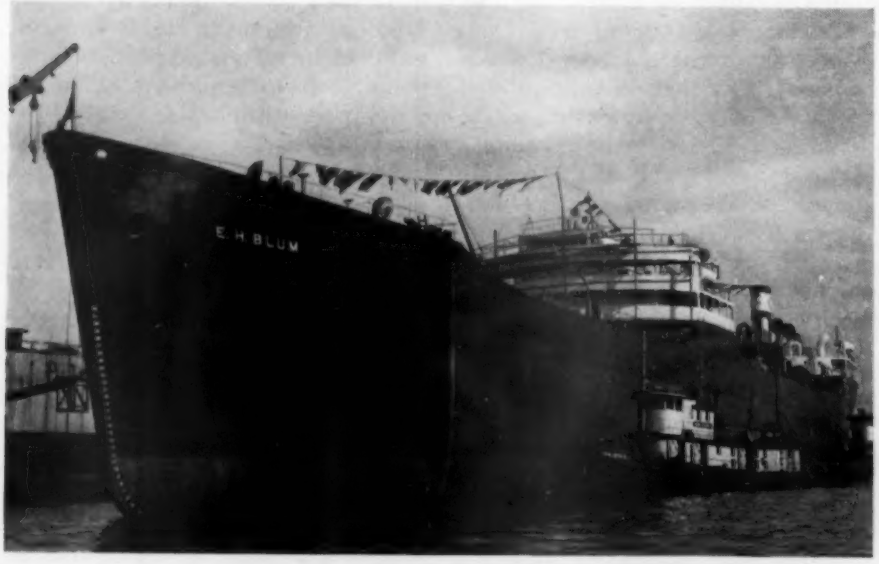
Another All-Welded Tanker

The fifth all-welded tanker to be placed in service by the Atlantic Refining Co. features high operating perssures and temperatures.

The S.S. E. H. Blum slips down the ways.

THE Steamship E. H. Blum, a 19,405 ton oil tanker, the newest of the Atlantic Refining Co. fleet, was launched at the Chester, Pa. yards of the Sun Shipbuilding and Drydock Co. on March 15th.

The vessel, which was named for E. H. Blum of Dallas, Tex., a vice president and director of the Atlantic Refining Co., is of all-welded construction, with an overall length of 544 Ft. Her capacity will be the equivalent of 154,000 barrels or 6,500,000 gallons of gasoline. With the aid of all-welded construction it was possible to complete the vessel in record time. Her keel was laid Oct. 3 and she will be placed in service on April 1.



The All-welded Tanker at the Fitting Dock.

Like the four other Atlantic tankers which proceeded her down the ways at the Sun shipyard during the past three years, this vessel is of turbo-electric drive. She is powered by a 4,500 KW main turbo-generator through a 5,000 hp. synchronous motor coupled to the propeller. Steam power for the turbines is generated in boilers operating at 625 pounds per square inch pressure and 920 degrees F., the highest pressure and temperature now in use in the American merchant marine.

The latest addition to the Atlantic fleet, with a sea speed of 13.25 knots, is to go into service on April 1 and will run between Philadelphia and Texas Gulf ports.

Brief Sketches of Welding Jobs

Studs, carbon blocks and brazing soon replaced the broken teeth on this bull gear.

The built-up teeth wear well as is shown by these teeth after several years of service.

Brazing Replaces Broken Tooth

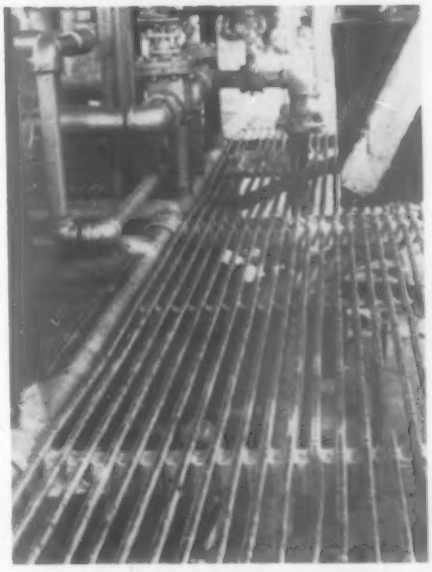
By S. S. Brewer

The merry-go-round broke down! Usually such an announcement is bad news for everyone but this time it was not bad news to a small welding shop in Washington. The merry-go-round failure resulted from the breaking of several teeth from the bull gear.

Having made a similar repair several years before this job was comparatively simple despite the shop's lack of elaborate tools. Really all the tools needed consisted of drills, taps, a hack saw, a course file, a couple of blocks of carbon and naturally, welding equipment.

The job which did not even require preheating, was accomplished as follows: Drill and tap the broken tooth to accommodate a stud slightly smaller than the finished tooth. These drilled holes should be about spaced so that the distance between studs is $\frac{3}{16}$ to $\frac{1}{8}$ in. and they should be drilled to a depth of about $1\frac{1}{2}$ times the stud diameter. Care should be taken to see that the stud "jams" tightly against the bottom of the hole.

Now the carbon blocks as set up so that a tooth slightly oversize is obtained when the deposition of bronze has been complete. The tooth is now filed to shape finishing the rebuilding task.



Arc welding and discarded sucker rods form a safety platform.

Safety Platform

By M. T. Pate

On an outdoor pump setting of an oil field drill rig where rain, mud and muck constantly make walking a hazard, pump servicing is often unsafe. At one rig, a weldor was called in to provide a safe economical and portable flooring for the firemen's use in servicing pumps.

The walk which was made of salvaged ¾-in. sucker rods, was formed by laying rods in the direction of travel and welding them to cross rods at three of the intervals. Placed on timber bents level to the pump platform height, these open walks permit through drainage and may serve as scrapers to remove surplus mud from the feet of the workers. As a further safety precaution, the upper surface of the rods were roughened. This was a simple operation with an arc welder since it was only necessary to strike an arc at a desired spot and lay a small bead or projection across the rod at 3 in. intervals.

» «

A Tight Lipped Bucket

Clam shell buckets with worn lips are a nuisance. They not only fail to grab a full load but also allow the load to leak as it is being delivered. Surely the lip can be renewed but cutting rivets and replacing the lip and rivets is an expensive job, involving loss of time on the job. Naturally, everyone realizes that this loss of efficiency results in lost production but it often seems better to continue even inefficient production than to cease all activity for repairs.

One contractor is avoiding this loss of time and money simply by replacing that portion of the lip that is worn. This is done by flame-cutting away the worn edge and replacing this material by welding in place a nickel-manganese applicator bar. In this manner the repair is easily accomplished and a tight closing, long wearing lip is obtained.

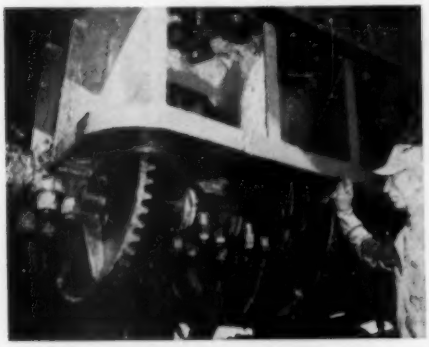
A weldor cuts away the worn and ragged clam shell lip (upper) and makes it ready to receive the applicator bar (lower) so that it will have a tight lip. (Photo Stulz-Sickles Co.)

Brief Sketches of Welding Jobs

Arc Welding Strengthens Equipment

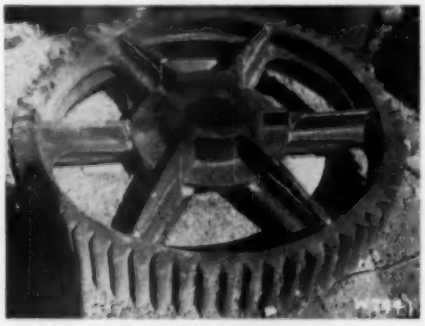
★Arc welding is used by the Northern Illinois Coal Corp., Joliet, Ill., for sterengthening its equipment and thereby lengthening the service life of this equipment.

In Fig. 1 is illustrated a special reinforcing bracket in the rear end of a 17 cubic yard coal stripping power shovel.



A stronger bracket.
(Photo Lincoln Electric Co.)

In the original design, a steel casting extended diagonally from the bottom flange of the main frame to the end bearing. Additional strength was provided by arc welding an extension outward (at point of the hand) from the bearing and upward to the main frame.



A stronger gear.
(Photo Lincoln Electric Co.)

This extension was fabricated from standard steel plate and bar stock.

An effective means of strengthening spokes in a cast steel gear for a power shovel is illustrated in Fig. 2. Pieces of 1-in. plate (indicated by chalk marks) were arc welded to the spokes on both sides.

» «

Improves the Fingerboard

★The upper end of drill pipe stacked in a derrick is held in place by a rack or fingerboard, which must support the pipe and to keep it from jamming or slipping together otherwise handling will be difficult when the drill pipe is again run into the well. The tops of the individual fingers serve as a platform for the derrickman as he racks the pipe, some 80 to 100 ft. above the derrick floor.

To form a fingerboard which will facilitate racking pipe and afford safe footing for the derrickman, one contractor's weldor built up a unit around the usual one-piece finger of bar steel which accurately guides the pipe and carries its own platform. On the top of the bar is welded a flat strip of steel, wide enough to afford firm footing, while companion strips line each side of the bar and present smooth surfaces along which the stands of pipe can be stacked.

The completed finger weighs more than the usual form, but possesses several times its resistance to bending or deformation when struck by the pipe. It also permits faster racking of pipe, thus cutting down on time lost from actual drilling of the well.

» «

Welding Seals Refinery Condenser

By Elton Sterrett

★Much of the upkeep of condensate coils in the cooling towers of refineries is occasioned by the tendency of the incoming stream of high temperature gases to "slug" or condense in a manner to cause serious hammering of the coils, with consequent failure of joints and loss of product.

One refinery, faced with this problem, devised an all-welded pre-condenser which effectively eliminates the "slugging" in the tower coils and satisfactorily withstands the severe service imposed on it. The condenser consists of a section of 16 in. pipe, forming the outer shell, and carrying two steel inner heads or tube sheets, in which are welded 100—1 in. pipes for the passage of the gases and their conversion into liquid.

The unit was built up by welding the tubes into both heads, sliding the tube section within the pipe, and welding it in position there, at the same time completing the water section between heads and around tubes. Connections for incoming and outgoing streams in the end sections were then welded to the shell and the unit completed by welding in nipples for the cooling water flow through the shell between the tube sheets.

Th unit as designed and built has been in service for more than twelve months, with no lost time either of condenser or water tower coils during that period.

» «

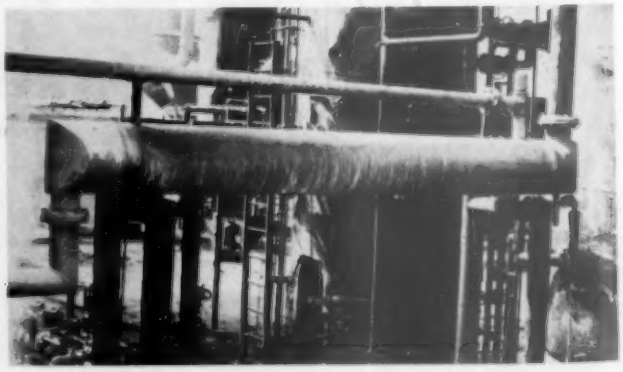
Welding thin galvanized sheet is tricky.
(Photo Lincoln Electric Co.)

Welded Products of Galvanized and Black Iron

★Strong-Scott Mfg. Co., Minneapolis, Minn., regularly fabricates its products, composed of galvanized sheets and black iron, by electric arc welding. Galvanized sheets of 16 and 12-gauge thickness, are arc welded in production of double flour feeders. Black iron in 10 and 12-gauge material is arc welded in production of classifiers for pulverizing machines. It is said to permit the fine adjustments in curent and voltage necessary in welding galvanized metal.

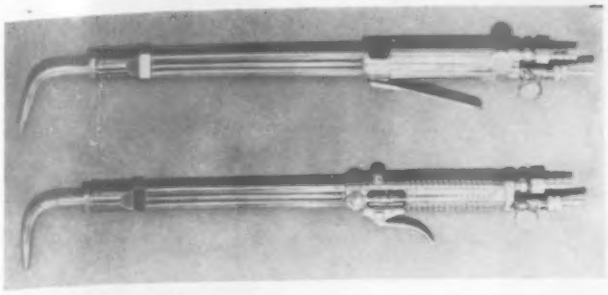
The welding of galvanized sheet presents some very tricky problems because of the fine adjustments of current and voltage that are required.

Welding makes for better and safer work.



An effective inexpensive condenser.

New Product Developments



Designed for flame cutting risers suited for any type cutting.

New Riser Cutting Apparatus

★ **Air Reduction** has just introduced a new line of hand cutting apparatus. This apparatus consists of two torches and three tips for use in removing riser heads from metal castings.

The new torches, **Styles 3180 and 9080,** are of the straight head type. Both have monel metal heads and stainless steel tubes and each is 21 inches in length. Cutting oxygen can be controlled by either a lever or trigger, and the type selected can be placed on top, on either side or on the bottom of the torch to suit the convenience and comfort of the individual operator.

The new cutting tips are known as **Style 187** bent to 75°; **Style 181** bent to 90°; and **Style 191** which is a straight tip, 7 inches long, Style 191 is not illustrated. They are designed to permit greater maneuverability in the restricted areas and cramped quarters frequently encountered in riser cutting. The shorter length from the end of the tip to the bend makes this possible.

While designed especially for cutting risers, this new Airco apparatus is also used successfully for removing rivets, for construction and repair jobs in shipyards, and as standard hand torches for regular and other special applications. Further information about this new equipment may be obtained by writing to Air Reduction, 60 East 42nd Street, New York, N. Y.

» «

Electrode for Flame-Hardening Deposit

★ A new type of welding electrode called **"Harnimoly"** introduced by the **Harnischfeger Corp.** presents many new possibilities in the welding of parts that require machining and flame or heat treatment during the process of manufacture. Though easily machinable in the as-welded-state, the metal deposited by "Harnimoly" after flame treatment takes on the same qualities as the parent metal, giving a uniform hardness throughout.

Physical Properties of "Harnimoly" (Average)

Tensile Strength	85,000-90,000 P.S.I.
Yield Point	65,000-70,000 P.S.I.
Elongation in 2"	15%-20%

In type, "Harnimoly" is a shielded arc type electrode for welding joints and surfaces on high carbon or alloy steels that can be flame hardened up to 415 Brinell, or hardened by heat treatment. This electrode is not recommended for hard surfacing except where flame hardening or heat treatment is to be employed after welding.

Upon request the Harnischfeger Corp., 4513 W. National Ave., Milwaukee, Wis., will send complete information on applications and procedures.

» «

Sealed against sabotage.

Fire Extinguisher Seals

★ To facilitate frequent inspection and to tell at a glance whether pump type extinguishers have been tampered with or used, **Pyrene Gardeseal** are now introduced by the **Pyrene Manufacturing Co.**, Newark, N. J. These Gardeseals are bright red, trademarked, visual signals or handle seals that are destroyed the moment an extinguisher is taken from its bracket. Gardeseals, easily applied by soaking in water and placing over handle and bracket, shrink to a tight seal in an hour. Packed 25 seals to a carton.

» «

Ignitron Spot Welding Rectifier

★ Designed especially for supplying required d-c current to magnetic energy-storage type spot welders such as are used for joining aluminum in the aircraft industry, a new **ignitron spot welding recifier** is announced by the **Westinghouse Electric and Manufacturing Co.** The new rectifiers are available in two capacities, one for use with 40 kw., the other for 120-kw. spot welders. Each rectifier will operate two welders if they are sequenced so that only one can be loaded onto the rectifier at a time.

The rectifier consists of a control and protective panel, power transformer and ignitron power tubes all contained in a forced ventilated floor mounted sheet metal cabinet with a heavy welded base frame. Tubes are arranged for water cooling, and cooling is controlled by a thermostatic water flow switch. The control and protective panel is located in the top of the cabinet and the ignitron assembly in the bottom. Hinged doors provide access to the front of the cabinet and the back is removable for maintenance. A 14-inch fan, driven by a ⅛-hp. motor cools the transformer, exhausting through a grill at the rear of the cabinet.

Further information on these ignitron rectifiers for magnetic energy-storage welders may be obtained by writing department 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

» «

New Cylinder Truck

★ A new hand truck designed to carry an oxygen cylinder, an acetylene cylinder, and a complete welding and cutting outfit, has just been announced by **The Linde Air Products Co.**, a unit of Union Carbide and Carbon Corp. This new truck—known as the **Oxweld T-7 Two-Wheel Welding Truck**—is said to be light in weight, well balanced, and has 14-in. wheels equipped with semi-pneumatic rubber tires. The T-7 weighs considerably less than the former all steel-wheeled trucks which it replaces.

These features are claimed to make the truck exceptionally easy to maneuver. The new design results in a 4½-in. reduction in overall width of the truck, permitting passage through narrower openings. As an added feature, the size of the the removable metal tool box, for extra blowpipes, tips, goggles, and wrenches, has been increased.

Easily handled as it silently rolls.

Fig. 1—A multiple spot welder capable of 2 to 12 spot welds simultaneously.

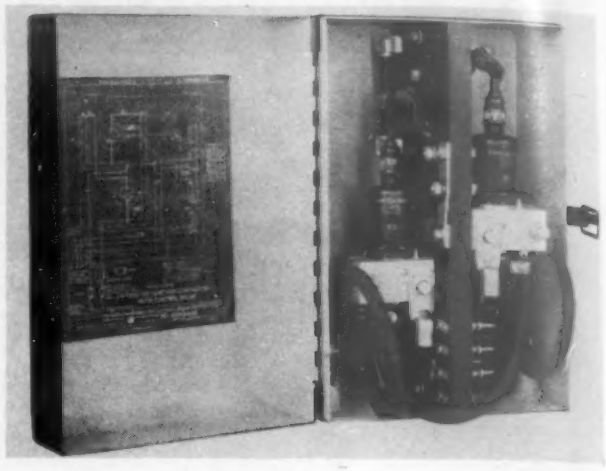


Fig. 2—Water-cooling is a feature of this ignition tube.

Multiple Spot Welder

★ The **Eisler Engineering Co.**, 740-770 So. 13th St., Newark, N. J., has recently introduced a **Multiple Spot Welder** on the market. The various multiple spot welding setups possible on this machine are shown, inset, in the accompanying illustration. Adjustments can be made to make circular, straight, square, rectangular or any odd shape welds, to conform with any need. From 2 to 12 spots can be made simultaneously, depending on the nature of the job. These machines are primarily intended for the Spot Welding of light sheet metal work where a large range of adjustments for various spots and shapes are to be considered.

Pressure electrodes are used with suitable air operation equipment. The electrodes have an individual adjustment so as to maintain an even pressure on all the spot welds being made.

» «

Automatic Vise

★ An automatic vise and clamping tool has recently been placed on the market by **The Automatic Vise Sales Co.**, 2845 Sunset Place, Los Angeles. The use of the foot pedals for the clamping and releasing of the work is a major time-saving feature. A free-sliding, movable jaw can be easily pushed with hand or body against the work and then clamped and released by means of foot pedals. The main clamping pedal gives sufficient pressure for general work—the pressure being regulated light or heavy. If additional pressure is desired, a small auxiliary pedal will give extra pressure for any holding requirements. By adjusting the small screw on the right hand side of body, the tool can be set for repetitive work. All vital parts are made of case hardened steel. Some types of mounting are available directly on the bench or as a portable stand, thus permitting movement whenever or wherever desired at any time and making available a quick-acting automatic vise inside or outside of the shop.

New Ignitron Tube

★ A new ignitron tube, **Type GL-415**, for resistance-welder control, utilizing a unique water-cooling system has been announced by the **General Electric Co.** The new tube depends for its cooling upon a special clamp into which it is fitted, rather than upon the built-in water-jacket construction formerly used. Consisting of a brass block with water passages, the clamp not only serves as a cooling medium but also as the cathode connection. Since there are no water connections to the tube itself, removal and replacement of tubes may be made easily and quickly.

It is claimed that the ability to pass high-peak currents, makes these ignitron tubes particularly suited for controlling the current of resistance-welding machines. They are of metal construction, and the absence of moving parts is said to contribute to long life with a minimum of "down" time.

A pair of the tubes is capable of controlling 265 kva. of resistance-welding load on a 5½ per cent duty cycle. They can be used at reduced rating with air cooling, when desired. With suitable control, the tubes can be used also for accurate, short-time welding.
bership.

» «

Metallizing Gun

★ The **Metco Metallizing Gun**—Type 2E has been announced by the **Metallizing Engineering Co. Inc.**, 2107-41st St., Long Island City, N. Y. The Type 2E gun has two new outstanding features, the "Controlled Power Unit" which gives absolutely uniform and steady wire feed for production service, eliminates the need for changes and the "Universal Gas Head" allows the use of Acetylene, Propane, Hydrogen, Natural or Manufactured gas with balanced pressure and without changing head.

The complete tool is extremely light, weighing only 4¾ lbs. The gear case is made of Aluminum Alloy and is completely sealed. Simple two-piece case construction combined with removable drive gear and roll make the unit easy to clean and inspect. Precision ball bearings are used throughout. Bearing housings constructed of brass are mounted in the case. All parts effecting alignment are assembled with dowel pins or cylindrical fits. Alignment is not dependent on threaded sections. Worms are cut integral with their shafts and are ground after hardening. Wire nozzles are of bronze with a hardened, heat-proof lining which will not fuse or stick to the metal being sprayed. Gas head is made of a dense pressure tight bronze, and separated completely from the case assembly, eliminating any danger of inflammable gases collecting in the case. All parts are completely interchangeable, and may be assembled without adjustments.

Fig. 3—Uniform wire feed and satisfactory operation on any gas is claimed for this metallizing gun.

It is claimed that the lightweight, perfect balance and easy hand grip combine to eliminate operator fatigue. Maximum air pressure required is only 65 p.s.i. Rugged in construction the Type 2E gun is said to be ideal for heavy duty metal spray work.

A jig to assist in changing to pneumatic rims.

Wheel Jig

A new **Wheel Jig** has been announced by **W. D. Alber,** Beatrice, Neb. for use as a welding jig when changing steel rimmed wheel to pneumatic rims. The jig has been designed to hold a wheel without hub by use of hollow flanged cone. It is suitable for use on all rims up to 20 in. dia. and by use of extension arms it will accommodate larger rims.

The Alber Wheel Jig is complete with cast frame, machined cones, hand wheel for clamping hub, adjustable rim landing and a scribe for centering rims and marking spokes.

» «

Arc Torch

The **Wiese Plow Welding Co.,** Perry, Iowa, announce a new arc torch for an AC or DC Welder, which is called the **Wiese Torch.** This torch uses ⅜-in. carbons, and can also use smaller sizes. It comes complete with ten feet of extra flexible leads with lugs.

The operation is through a spring tension at the back of the handles. The arc is controlled by the two handles and these can both easily be held in one hand, giving complete control of the arc at all times so it can be struck or broken instantly. No screws or thumb nuts are necessary to adjust the arc.

Two handles and tension springs make arc control easier.

New ¼-in. Electric Drill

★ **Black & Decker Mfg. Co.,** Towson, Md., announce a new ¼-in. **Standard Ball-Bearing Drill.**

This tool is a practical, popular-priced, production drill with high power, compactness, and light weight. Equipped with anti-friction bearings throughout, splined gear mounting, locked inner and outer races on spindle bearing, and removable commutator end cover. With close offset and choice of end or side handle, this drill is particularly adapted to aircraft work, with a full range of spindle speeds to meet aircraft production requirements.

A lightweight drill capable of high speed.

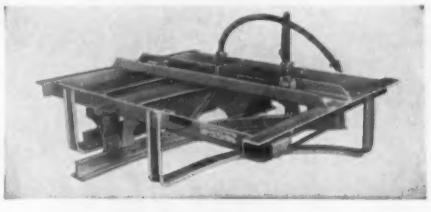
Its drilling capacity in steel is ¼ in.; ½ in. in hardwood. The standard speed is 2000 r.p.m. and is available, also, in speeds of 3500 and 5000 r.p.m.

» «

Crane Switch

★ A new **air-operated switch** has been developed by the **Cleveland Tramrail Division** of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, for use on cab-operated, gravity, or automatic dispatch overhead materials handling systems. This development enables the tramrail operator to pre-set the switch at some distance ahead while traveling and thus lose no time. Likewise indexes on gravity or automatic dispatch carriers may be set to actuate trippers which will cause one or several switches to take the positions desired.

The switch is ruggedly built of steel welded. It consists of two main assemblies—an outer supporting frame and an inner sliding frame. The outer frame is designed for bolting rigidly to the superstructure. The inner assembly carrying a straight and a curved rail, rides on multiple easy operating rollers, and is set in position by an air cylinder. Systems employing Cleveland Tramrail air-operated switches can be furnished in all capacities up to 5 tons.



Air operates this over head crane switch.

» «

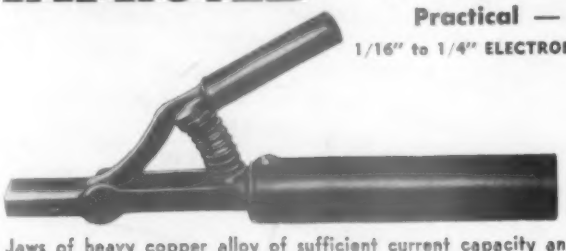
To one who knows, advice is unnecessary; to one who does not, it is not enough.—*Seneca.*

Even if you are on the right track, you will get run over if you just sit there.—*Rays of Sunshine.*

IMPROVED **SIMPLEX ELECTRODE HOLDERS**

Practical — Economical — Light

1/16" to 1/4" ELECTRODES **WEIGHT 15 OZ. EACH**



Style "S" (Soldered Connection)

Jaws of heavy copper alloy of sufficient current capacity and strength to withstand duties of its class. Sturdy compression spring supported by heat resisting insulating seats. Current can not pass through spring. Insulating fibre handle permits firm balanced grip. Style "S" (Soldered connection) has rear end of fixed jaw cored to receive cable, insulating handle covers connection. Style "R" (removeable connection) carries cable to a point ahead of handle where it is firmly clamped to prevent heating. Unnecessary to divide or rearrange cable strands.

WRITE FOR CATALOG No. 20
JUST OFF THE PRESS

Style "R" (Removeable Connection)

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THE FIBRE-METAL PRODUCTS CO. CHESTER, PENNA.

News of the Industry

Iron and Steel Engineers Meet

The **Association of Iron and Steel Engineers** will hold their **Annual Spring Conference,** April 28, 1931, at the Ohio Hotel, Youngstown, Ohio. The program of the conference will be devoted primarily to steel mill operation problems. There will also be included an inspection trip through the Sharon Works of the Sharon Steel Corp., Sharon, Pa.

N. J. Welding Meeting a Success

The **First Welding Exhibit** of the **Northern New Jersey Section,** A. W. S., which was held in Newark, March 21 and 22, proved to be a Miniature Metal Congress in every sense of the word. It is estimated that more than 8,000 visitors view the exhibits and demonstrations of the 41 exhibitors. Several of the exhibits were outstanding because of their photographic exhibits, models and weld specimens.

» «

Kansas U. Welding Conference

The **Seventh Annual Welding Conference** of the **University of Kansas** will be held in Lawrence, Kan., April 25 and 26, 1941, according to an announcement by **Dean J. J. Jakosky** of the School of Engineering and Architecture. The conference will be sponsored jointly by the University and the Kansas City and Wichita Sections A.W.L.

» «

Needed by Federal Government for Defense Work

Fuel Rating Mechanics

Laboratory mechanics experienced in fuel rating are needed by the Federal Government. An examination to fill these positions has been announced by the United States Civil Service Commission. The positions pay from $1,620 to $2,000 a year, less the usual retirement deduction. Appointments will be made at the National Bureau of Standards, Department of Commerce.

Responsible experience in the operation, testing, or maintenance of internal-combustion engines including experience in rating fuels with a CFR engine is required. Persons appointed as laboratory mechanics in fuel rating will make routine and referee ratings of motor, aviation, and Diesel fuels using the ASTM-CFR engine, the CFR aviation engine, or the CFR Diesel engine. They will record and tabulate the test data based on their findings. The duties of these positions also include the inspection and overhaul of test engines, and the installation of test equipment.

Applications must be filed at the Commission's Washington office not later than April 17, 1941.

Superintendents of Construction

An examination has been announced by the United States Civil Service Commission to secure superintendents of general construction for work in the national defense program. There are several grades of positions with salaries ranging from $3200 to $5600 a year, less a 3½ percent retirement deduction. In general, the duties involve the direction of foremen, laborers, and mechanics on large construction projects. Appointees will inspect materials and workmanship to see that they conform to specifications and will organize men and materials for efficient construction operations.

Competitors must have had progressive experience in the field of general construction. Part of this experience must have been as superintendent on large projects involving excavation, reinforced concrete, steel, wood, and masonry, and supervision of three or more foremen of different building or construction trades. Engineering courses completed at a college or technical institute may be substituted for part of the general experience.

File applications until Dec. 31, 1941.

When you need
RODS for Special Applications
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Large stocks include McKay Certified Stainless Electrodes, Alloy, and Hard Surfacing Rods.

For sound, strong, dependable welding jobs, choose Ryerson Rods—they're tops for speed, economy, and performance.

McKay Stainless Electrodes—carried in stock at 10 conveniently located Ryerson plants — lower fabricating costs . . . leave cleaner, smoother deposits . . . penetrate deeply . . . and have low spatter loss. Certified weld deposit analysis is stamped on each package — a definite advantage over core wire analysis which is often changed considerably in actual welding. The type is clearly die-stamped on each rod. Large stocks of many types and sizes assure prompt reliable service at all times. Write for bulletin. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

Aeronautical Engineering Inspector

There is an increasing need in the national defense program of the Navy Department for persons qualified as inspectors of aeronautical engineering materials. To fill these positions, the United States Civil Service Commission has announced an examination covering several branches of aeronautical engineering. The salaries range from $1,620 to $2,600 a year, less the usual retirement deduction. The maximum age for these positions is 65 years.

Applications will be rated as received at the Commission's Washington office until further notice.

» «

N. Y. Engineer's Convention

The **New York State Society of Professional Engineers, Inc.,** will hold its Annual Convention at the Hotel Commodore, New York City, May 8th, 9th and 10th, 1941. Frederick H. Zurmuhlen, President, announces that featured will be an exhibit of equipment, supplies and methods in the engineering field. Companies supplying the engineering field will be the exhibitors.

The success of an exhibit held several years ago led to adoption as an annual feature of the Convention. A number of leading companies have already announced their intention of exhibiting.

The New York State Society is composed of Professional Engineers licensed to practice by the State. Member attendance at the Convention is around 1,000. Offices of the Society are at 1941 Grand Central Terminal, New York, N. Y.

» «

Industrial Medicine Meetings

A "post graduate" Institute of Industrial Medicine and Industrial Hygiene, attracting industrial health specialists from all parts of North and South America, will be held in Pittsburgh, May 5 to 9, 1941. Scores of pertinent papers and discussions are scheduled on the medical and engineering phases of employee health protection.

The Institute marks the 26th annual meeting of **The American Association of Industrial Physicians and Surgeons,** and the second annual meeting of **The American Industrial Hygiene Association.** Majority of the sessions will be held at Pittsburgh's William Penn Hotel.

» «

Omaha Confab Is "Tops"

L. O. "Heinie" Schneiderwind directed the **Omaha Welding Company's 7th Annual Welding Confab** to the most successful meeting which this organization has held. Registrations for the four-day discussion of welding problems totaled 889, topping the 1940 total by 281. The confab was held in the Omaha headquarters March 4-7.

In planning the meeting there were no formal papers presented, rather those in attendance were given time to watch actual demonstrations and ask questions of those manufacturers representatives who were on hand to straighten out operating difficulties. The success of this idea is indicated by the fact that many who came from all over Nebraska stayed two or three days to see how to do it and find out why.

Some Serious Moments at Omaha Welding Confab.

Titan Provides the Correct Alloy

FOR EVERY OXY-ACETYLENE BRONZE-WELDING PURPOSE

TITAN Welding Alloys are all scientifically designed, alloyed and fabricated to produce the best possible results for purposes recommended. TITAN Alloys are exceptionally low-melting. Uniformity is assured by rigid laboratory control. *Double deoxidation increases the ductility of the weld, reduces fuming to a minimum and assures a sound, dense deposit.*

TITAN Alloys are furnished in three distinct groups:

- **MUNTZ TYPE: General Purpose Rods, for High-strength Ductile Welds.**
  PENN BRONZE, doubly-deoxidized, low-fuming; flows at 1628°F.
  TITAN BRAZING BRONZE, flows at 1625°F.
- **TIN BRONZES: Hard, Corrosion-resisting; very good on Cast Iron.**
  TITAN BRONZE, doubly-deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL BRONZE, flows at 1615°F.
  TITAN WEARWELL BRONZE, flows at 1593°F. Special purpose rod possessing great hardness; for building up worn surfaces and for bearing service, etc.
- **MANGANESE BRONZES: (General Purpose) Specifically recommended for Cast Iron.**
  TITAN MANGANESE BRONZE, doubly deoxidized, low-fuming; flows at 1617°F.
  TITAN NAVAL MANGANESE BRONZE, flows at 1620°F.

Only the purest of raw materials are used in manufacture of TITAN Welding Alloys. Electrolytic copper 99.96 plus in purity and electrolytic zinc 99.99 plus are used, in order to assure elimination of elements, which, if introduced into alloy would prove detrimental to quality and uniformity. *TITAN has established new high standards for bronze rod manufacture.*

Ask for descriptive folders. Sample rods sent upon request.

TITAN METAL MANUFACTURING CO., BELLEFONTE, PA.

TITAN BRONZE WELDING ALLOYS

The 13th Annual Welding Conference at Iowa State College which was held March 19, 20 and 21 was the most successful of the many welding conferences to be held in Ames. In the closing hours the registration indicated that last year's high of 420 visitors would be surpassed by at least 33 per cent. Contributing to the success of the conference was the highly diversified exhibit of 14 "jobber" exhibitors as well as an interesting technical program.

The program presented follows:

Wednesday, March 19

8:00 A.M. Registration, Engineering Exhibit Hall

9:00 A.M. Exhibits and Demonstrations, Exhibit Hall
Room 207, Engineering Hall

1:00 P.M. How Metals Change in Welding
Mr. **R. W. Breckenridge,** Mech. Engr. Dept., I. S. C.
Selection of Electrodes for Welding,
Mr. **E. E. Clark,** Harnischfeger Corp.
Low Temperature Brazing,
Mr. **Sam Fetter,** Air Reduction Sales Co.
Building the PBY Record Breaker,
Sound Motion Pictures by Consolidated Aircraft Corp.

4:00 P.M. Demonstrations, Exhibit Hall

Thursday, March 20

9:00 A.M. Demonstrations, Exhibit Hall.
Room 207, Engineering Hall

1:00 P.M. Training Welders — For General Welding to Meet Government Tests
Mr. **L. A. Thesenga,** Smith Welding Equip. Corp.
Hard Facing for Job Shops in Agricultural Areas,
Mr. **T. B. Jefferson,** *The Welding Engineer,*
Using the Welding Torch for Bending and Straightening,
Mr. **C. W. Ferris,** Linde Air Products Co.
What a Job Shop Welder Thinks About,
Mr. **Henry Malek,** Iowa Electric Welding Co.
Welders Round Table — Oxyacetylene Welding
Discussion Leader — Mr. **L. C. Monroe,** *The Welders Digest.*

4:00 P.M. Demonstrations, Exhibit Hall

6:30 P.M. Welders Banquet, Direction Mr. **W. L. Allan.**

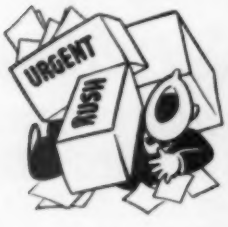
Friday, March 21

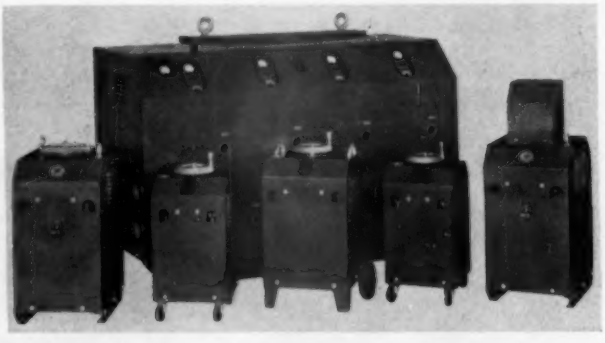
Room 207, Engineering Hall

9:00 A.M. Aluminum Fabricating Processes,
Motion Picture by U. S. Bureau of Mines.
Factors Which Affect the Strength of Parts, Illustrated by the use of bakelite models and use of polarized light,
Mr. **Glenn Murphy,** Mechanics Dept., I. S. C.
Alternating Current Arc Welding,
Mr. **R. M. Armstrong,** Machinery and Welder Corp.
A Reading Course in Welding and Metallurgy
Mr. **L. C. Monroe,** *The Welders Digest.*
Welders Round Table—Arc Welding,
Discussion Leader — Mr. **H. I. Gibbs,** Gibbs Welding Supply Co.

1:00 P.M. Demonstrations, Exhibit Hall

BURIED?





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Put a G-R on your welding job and watch out-put go up! It's the welder that gives you MORE welding per man-hour, per kilowatt of current, per foot of floor space—a job-tested welder engineered to YOUR job, large or small. You'll be dollars ahead to get the facts about it NOW.

P.S. — You can get G-R sets with Remote Control, Power Factor Correction, built-in switching control for automatic-head welding . . . EVERY modern feature for BETTER WELDING at LOWER COST.

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with the
MODEL 1000

DOCKSON
ELECTRODE HOLDER

SEE YOUR JOBBER OR WRITE

Features—Jaws that tenaciously grip the electrode at any angle, quickly and easily release and replace stub ends with new electrodes. Fibre cups insulate tension springs. Extremely sturdy pivot construction. Light weight fibre handle for a cool, comfortable grip.

DOCKSON Corporation
WELDING & SAFETY EQUIPMENT
3867 WABASH AVE. • DETROIT

WELDING AND CUTTING TORCHES
REGULATORS
ELECTRODE HOLDERS
HELMETS - GOGGLES
ACCESSORIES
FACE SHIELDS

Trade News

Tweco Products Co., Wichita, Kan., manufacturers of Tweco ground clamps and welding accessories, announce the removal of their plant to new and larger quarters. Their new address is: English at Ida, Wichita.

» «

The **Stulz-Sickles Co.**, 134-142 Lafayette St., Newark, N. J., producers of Manganal 11 to 13½% manganese-nickel steel, Bare and Tite-Kote Welding Electrodes, Applicator Bars, Hot Rolled Plates, Cast Wedge Bars have appointed the following distributors:

The Baum Iron Co., 13th and Harney Sts., Omaha, Neb. **James C. Dawes Co.**, 24 North Fifth St., Martins Ferry, Ohio. **The Faeth Co.**, 1127-31 West 8th Sts., Kansas City, Mo. **The Kacena Co.**, Cedar Rapids, Iowa. **New York Welding Supply Co.**, 75 Grand St., New York City, N. Y. **Sioux City Iron Co.**, Sioux City, Iowa. **Velde, Roelfs & Co.**, 303-307 Margaret St., Pekin, Ill.

All of these firms carry a complete stock of these allied products, available to the consumer for immediate shipment out of warehouse stock.

Personals

A number of sales department changes are announced by the General Sales Manager of **Norton Co.**, Worcester, Mass.; **R. O. Anderson**, from District Manager in Pittsburgh to Worcester where he will report directly to **W. R. Moore**, General Sales Manager; **C. B. Price**, from the Southeast section to District Manager at Pittsburgh; **Lorin W. Grubbs** who has been assisting Mr. Price in the eastern part of his section will continue to serve that area and **Zachary M. Almand** from Sales Engineering department at Worcester will take over the western part of this territory; **G. T. Taylor**, from New York City area to the Chicago district; **J. S. Anderson** from Pittsburgh to New York; **W. A. Russell**, Field Engineer in Pittsburgh, will take over the Pittsburgh sales territory; **J. L. Tobey** of the Sales Engineering department at Worcester becomes Field Enginer at Pittsburgh; **J. E. Strachan, Jr.**, recently Field Engineer in New England, has been assigned as a salesman in southern Ohio.

» «

H. C. Meyer, Jr., is now associated with the Chemical Division of the **Foote Mineral Co.**, Philadelphia, Pa., as a junior analyst in the laboratory. Mr. Meyer attended the University of Pennsylvania and has had previous experience during the summers in the laboratory of this company.

» «

Lou R. O'Connor, 2109 Boyer Ave., Seattle, Wash., has been appointed representative of **Ampco Metal, Inc.**, Milwaukee, Wis. His territory will include the states of Washington, Oregon, Idaho, and Western Montana.

» «

Louis H. Burr, for 17 years production manager of **The Austin Company's** steel fabricating division, has been named works manager to succeed the late James E. Ferguson. Mr. Burr attended school in Toledo and was graduated from Denison University in 1906. He was structural superintendent of the Toledo Bridge & Crane Co. at Toledo for some years and was associated with the Case Crane & Engineering Co. immediately prior to joining The Austin Co. as production manager in 1924.

More than 50,000 tons of welded steel has been produced under the direction of Mr. Burr, who has had direct responsibility for fabrication of tree-form and other welded members applying Austin designs. He is a member of the American Welding Society.

IN 1936—SOMEBODY SAID

"Scrap it!"

Oxy-acetylene welding with 10 lbs. of Tobin Bronze rod saved this 300 lb. casting from the junk pile. Repair-welded by Gemme Garage, St. Damase, Quebec.

But it was repair-welded with Tobin Bronze. Still going strong in December 1940!

When cracks appeared in the base of this crude-oil engine block, attempts to prevent their extension by clamps proved futile. In a short time they had practically encircled the cylinder — only fifteen inches of solid metal remaining between the ends of the cracks.

Replacement meant heavy cost and important time lost waiting for the new casting. It was then that Tobin Bronze welding was suggested. And just ten hours later, the engine base was ready to go back into service.

Every day similar cases demonstrate that expensive equipment, seemingly damaged beyond repair, can often be salvaged at nominal cost by welding with Tobin Bronze—a time-tried Anaconda product. The trademark "Tobin Bronze Reg. U. S. Pat. Off." is stamped in every rod. Look for it and be sure you get the genuine. 41133

ANACONDA

Anaconda Welding Rods

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

In Canada: Anaconda American Brass Ltd., New Toronto, Ont. • Subsidiary of Anaconda Copper Mining Co.

Obituary

James E. Ferguson, 65, manager of the fabricating division of The Austin Co., Cleveland, for the past 21 years, died March 3 in a Cleveland hospital after a very brief illness.

Mr. Ferguson was born in Marshall, Mich., and attended Cornell University, graduating with a degree in civil engineering in 1897. Prior to his joining The Austin Co. in 1920, he had served as production manager of the Toledo Bridge & Crane Co., and as plant manager of the American Steel Car Co., Havana, Cuba.

He was a member of the American Welding Society and the American Society of Civil Engineers.

» «

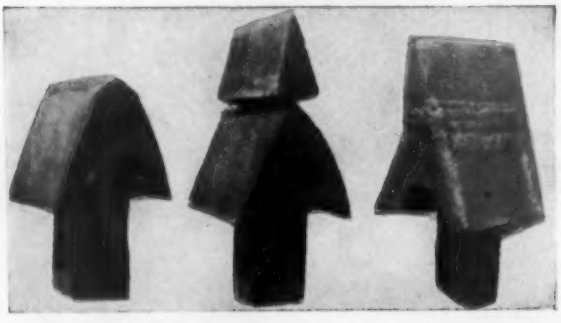
John D. Tierney, President, Storts Welding Co., Meriden, Conn., died on February 25, 1941. Mr. Tierney was born on March 29, 1890, and began his career in the Middle West in the sales and advertising field. In 1925 he became proprietor of Storts Welding Co. He was one of those who early saw the possibilities of welding in production and in developing and expanding the business of the Storts Welding Co. and wisely placed all emphasis on quality workmanship, setting up standards of fabrication from which no deviation was ever permitted.

Mr. Tierney was an active and useful member of the American Welding Society throughout his activity in the industry, always willing to contribute to the general knowledge of the art from his own experience and observation. In his own organization he was held in high regard on account of the sincere personal interest which he showed in the welfare of all of his associates and employees. Those who knew Jack Tierney even casually esteemed him highly for these aspects of his leadership and even more for his complete devotion to his family.

REGISTERED U. S. MANGANAL PATENT OFFICE

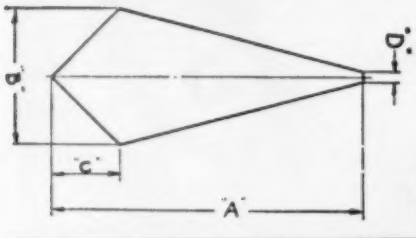
11 to 13½% Manganese Nickel Steel
(U. S. Patents 1,876,738, 1,947,167 and 2,021,945)

CAST WEDGE BARS



FOR REPOINTING MANGANESE AND CARBON STEEL SHOVEL AND DIPPER TEETH.

At Left—Cast Wedge Bar attached to worn down Shovel and Dipper Teeth.



Dotted Lines Indicate How to Cut Off for Different Widths of Dipper Teeth.

Send for descriptive circular and name of nearest distributor.

STULZ-SICKLES CO. *Sole Producers*
91 N. J. Railroad Ave., NEWARK, N. J.

The Improved "Round File" Gas Lighter

Immediate Ignition Assured

The Hood of the Improved "Round File" Gas Lighter is so designed as to form a "pocket" for the gas—an exclusive feature—which assures IMMEDIATE ignition. Get acquainted with the many other superior, exclusive features of Improved "Round File" *circulars and prices on request.*

SAFETY GAS LIGHTER CO. (Est. 1901) LYNN, MASS.

Current Reviews

Alloy Welding Bulletin

The **Aladdin Rod & Flux Mfg. Co.,** Grand Rapids, Mich. have released a four page bulletin giving information on the uses and application technique of the Aladdin Rods. There is included data on the welding of White Metal and the soldering of Aluminum as well as the prices of the rods.

» «

Fire Brick Booklet

Modern Fire Brick Manufacture is the title of the newest publication of the **A. P. Green Fire Brick Co.,** Mexico, Mo. which shows with Dramatic photographs the production of fire brick as it is carried on today in the A. P. Green Fire Brick Co. plant.

This booklet is something of an innovation—for a heavy industry to "take the plant to the user"; consequently this picture book should be of interest to those readers seeking information on fire brick and their manufacture. A copy may be obtained by addressing the company.

» «

Welding Materials

The **Foote Mineral Co.,** 1619 Summer St., Philadelphia, Pa., have issued a revised data book on **Welding Materials.** The materials described are titanium compounds, manganese compounds, silicates, fluxes, alloys and metals and organic fillers.

» «

Marine Construction Bulletin

★ **Gas Cutting Machines for Marine Construction,** a new 26-page bulletin issued by **Air Reduction,** New York, has been published to make available convenient descriptions of the various newly-developed machines for aiding fabrication by welding in the marine industry. Illustrative photographs display each of

(Continued on page 48)

Electric Welding Costs Quickly Checked

By R. A. GAST, Mechanical Engineer
The Lincoln Electric Co.
Cleveland, Ohio

IN Figs. 1, 2 and 3 are charted in graph form the actual arc speed in lineal feet per hour and the pounds of electrode required, including stub ends (2 in.) per lineal foot of weld, for plain butt joints, single vee butt joints, fillet joints and lap joints welded with shielded arc type electrode.

The actual welding speed with no allowance for set-up of work, operator fatigue or other factors can also be obtained from the graph charts.

The data contained in these graphs are based on use of correct welding procedure and proper fit up of work to be welded in flat position. Speeds in other positions such as vertical and overhead will in general be somewhat slower.

From the information given in these graphs, approximate welding costs can be estimated. However, it should be borne in mind that these speeds must be modified by a factor depending upon the time the welder actually welds.

NOTE: For purposes of calculation the following arc voltages may be used, for currents at mid range of those given: ⅛-inch electrode, 20 volts; $\frac{5}{32}$-inch electrode, 21 volts; $\frac{3}{16}$-inch electrode, 22 volts; ¼-inch electrode, 22 volts.

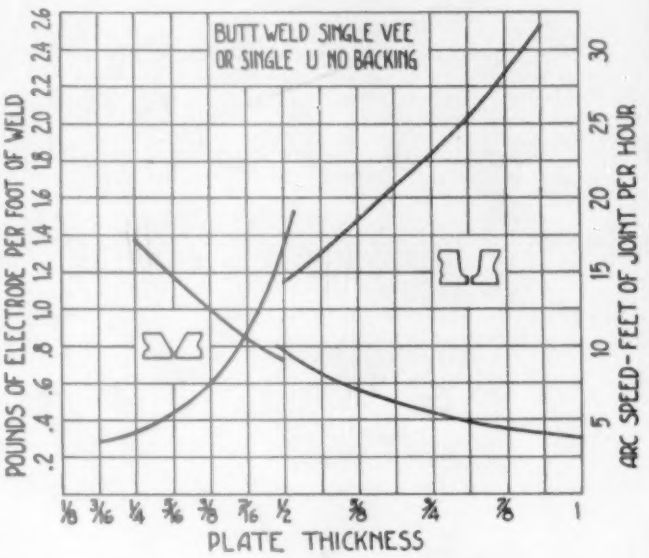

BUTT WELD SINGLE VEE
OR SINGLE U NO BACKING
POUNDS OF ELECTRODE PER FOOT OF WELD
ARC SPEED-FEET OF JOINT PER HOUR
PLATE THICKNESS

Fig. 2—Chart of welding speed and amounts of shielded arc type electrode for welding single vee or single U-groove butt joints.

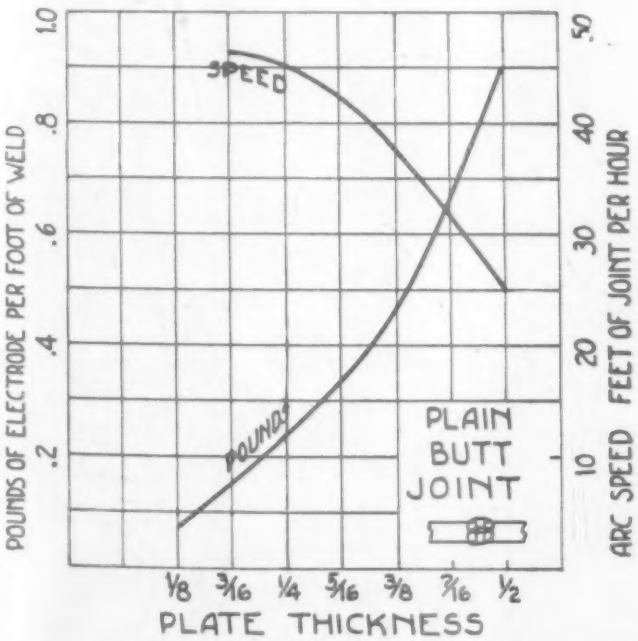


Fig. 1—Chart of welding speed and amounts of shielded arc type electrode for square groove butt joints.

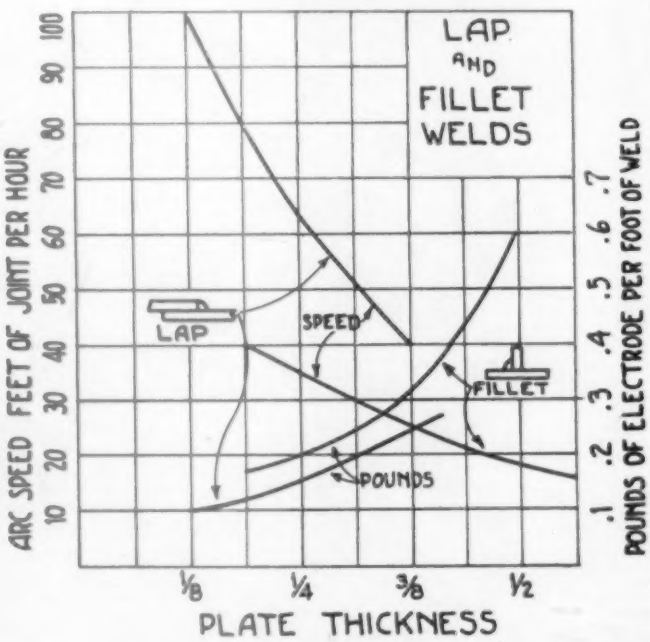


Fig. 3—Chart of welding speed and amounts of shielded arc type electrode for fillet and lap joints.

What-

HAS THIS NEW WELDING ELECTRODE TO DO WITH STEAM?

Resurfacing the seats of live steam valves is a typical application for this outstanding new electrode. It is also practical for building dies, shear blades, and numerous other purposes requiring a hard deposit capable of withstanding severe abrasion.

"HARTUNG" A Tungsten Molybdenum Alloy Electrode Air-Hardening — Maintains Hardness up to 1200°

"Hartung" produces a super-hard, dense deposit, free from porosity. In its as-welded state, it has a Rockwell C hardness of 55-65, and is capable of retaining its initial hardness at relatively high temperatures.

It's an all-position welding electrode, for flat, vertical, or overhead welding, on reverse polarity.

The air-hardening quality of its deposit metal makes "Hartung" a practical electrode for a variety of uses.

For full information on applications and procedures with P&H "Hartung" see your nearest P&H representative. Or write us.

P&H WELDING ELECTRODES

KEPT "Oven Dry" IN AIR-TIGHT CONTAINERS

You can now have every practical welding heat with one welding service. It's the new P&H-Hansen Square Frame Welder, which provides any current from 15 amps. upward, through simple, parallel hookup. Ask us to send Bulletin W-28.

General Offices: 4513 West National Avenue, Milwaukee, Wisconsin

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THE TECHNICAL SLANT

Teaching

FIFTY HINTS FOR TEACHERS OF VOCATIONAL SUBJECTS. *By M. R. Bass. Published by American Technical Society, Chicago, 1940. Paper, 5½ x 8½ in., 46 pages. 50 cents.*

M. Reed Bass has written 46 pages of enlightening information for vocational school instructors based on his years of experience as a director of trade schools. In these fifty hints, he has pointed out the errors commonly made by vocational teachers with results in the student failing to obtain the fullest possible benefit from his vocational training.

Among the important points or hints discussed are: Make definite assignments of work; Use understandable language; Avoid embarrassing the student and similar pointers on teaching for a more thorough understanding. This booklet should prove valuable for the many new instructors in our country's rapidly growing welding schools.

» «

Tubing

HANDBOOK OF WELDED STEEL TUBING. *Published by Form Steel Tube Institute, Cleveland, Ohio, 1941. Simulated leather, 5½ x 9 ins., 86 pages, loose leaf. Price $1.00.*

Improvements and refinements which have been made in the processes employed for manufacturing welded carbon and alloy steel tubing during the past ten years have resulted in the adoption of this material for structural uses in many large industries. There are inherent advantages in welded tubing due to the fact that it is formed from flat rolled strip and therefore has high physical properties and true concentricity of section.

The Handbook of Welded Steel Tubing has been published to furnish designing engineers with full information regarding standard sizes and properties of welded tubing. The book is exclusively devoted to those grades of welded tubing which can be figured as having a solid wall structure with no discontinuity or variation in physical properties occurring in the area affected by the welding operation during the manufacture. Standard sizes, together with commercial tolerance for roundness, wall thickness, straightness, etc., are tabulated for various grades of welded tubes. The manufacturing and fabricating processes are illustrated, and dimensioned drawings show on typical examples to what degree welded tubing can be cold worked in such operations as bending, beading, flanging, expanding, tapering, etc.

Special attention is given to recommendations for laying out fabricated parts and methods of checking. The reader is further provided with suggestions which will aid in developing designs for the most economical use of tubular sections. Numerous illustrations have been selected to show the wide variety of possibilities for using tubular members in addition to its present large-scale use in the automotive and furniutre industries.

You can always Depend on MILBURN

CUTTING, WELDING AND FINISHING EQUIPMENT

MILBURN CUTTING AND WELDING TORCHES—Sturdily constructed to highest government standards. Illustrated is the Type HMS—a modern development in the welding art. With attachments it can be used for welding, brazing, soldering and cutting.

TYPE OM SPRAY GUN—Light in weight, compact. Operates as production unit for continuous service or for touch-up work. Features "Hollow Air" atomizing principle. Top efficiency with all types of spray material.

MILBURN CUTTING AND WELDING TIPS—Made of special rolled copper and embody outstanding features to give high efficiency, longer life and lower consumption of gas. Interchangeable.

Write for complete catalog of paint spray equipment, welding and cutting apparatus and regulators.

The ALEXANDER MILBURN Company

1403 W. Baltimore St., Baltimore, Md.

Data You Need on WELDED STEEL CONSTRUCTION

by Robert S. Hale

A manual for the design, detailing, fabrication and erection of welded steel buildings, bridges and other steel structures.

CONTENTS

Chap. I....Reasons for Using Welded Steel Construction
Chap. II....Principles of Welding
Chap. III....Design
Chap. IV....Application of Design Principles
Chap. V....Drawings and Details
Chap. VI....Estimating Structural Steel Costs
Chap. VII....Fabrication and Erection
Chap. VIII....Inspection and Testing
Chap. IX....Conclusions
Six Appendices—Includes welding symbols, reference tables and graphs, building codes, specifications, etc.

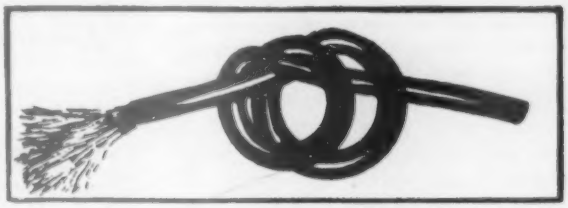
Here is a book containing working knowledge of welded steel structures for engineers, designers, architects, contractors, welders and students. Cloth binding, 181 pages, 50 illustrations. Price $3.00 per copy, post paid. Order your copy to-day from

THE WELDING ENGINEER
506 S. WABASH AVE. CHICAGO, ILL.

"MAJOR" RUBBER COVERED

Super-Flexible Single-Conductor Electric Arc

WELDING CABLE



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75 to 550 Amps

"TUFCORD" POWER CABLE

Two, Three and Four Conductor Types.
Underwriters' Approved

HANDSHIELDS
"IDEAL" and "SUPERIOR"

HELMETS
"LIBERTY" and "EUREKA"

LENSES
"EXCELLO" and "MONARCH"

HOLDERS
"BULLDOG"

We Invite
Price and Quality Comparison
With Your Present Source of Supply
Worldwide Distribution Benefits You

Get Full Details!
WRITE TODAY — to A. H. FRIESE, Pres.

Welding ENGINEERING COMPANY
MILWAUKEE WISCONSIN

Manufacturers — Distributors

Offices and Agents
All over the United States

Current Reviews

(Continued from page 44)

the machines and their functions in detail.

The bulletin described the various Airco gas cutting machines. All these motor-driven gas cutting machines serving essential functions in marine applications—some for portable some for stationary use. The bulletin describes these functions, explaining the use of certain machines for cutting straight lines, arcs and circles and combinations of the two. A section is devoted to templet cutting, plate edge preparation and flame machining special operations which can be performed with these machines when simple attachments are used. Other machines of the pantograph type claimed to be excellent for making cuts in ferrous metal of any reasonable thicknesses, are described; also those for continuous cutting of shaped openings; as well as the largest and most accurate of the Airco machines—for cutting an unlimited variety of shapes from steel plate, slabs, billets and forgings; and a machine especially designed for trimming the flanges and webs of beams. Where extra attachments are needed to perform special operations, similar information is included.

Copies of this bulletin may be obtained by writing Air Reduction, 60 East 42nd Street, New York, N. Y.

Aluminum Bronze Booklet

"Controlled Aluminum Bronze for Aircraft Parts" is the title of a 12-page booklet just issued by **Ampco Metal, Inc.**, Milwaukee, Wis., producers of Ampco Metal and other aluminum bronzes. The booklet is a reprint of an article by Mr. George K. Dreher, Ampco plant manager, which appeared in a recent issue of **Metal Progress.** The use of Ampco aluminum bronzes as essential alloys for the aircraft industry is discussed in detail. The booklet is well illustrated by photomicrographs, views of aircraft parts, charts, and tables. Copies will be sent to those interested in the subject.

» «

Welding School Booklet

The **Champion Rivet Company** are issuing a 16-page booklet entitled **"Electric Arc Welding"** dealing with the simple and fundamental facts of welding. Designed primarily for the student welder, it is being distributed gratis to private and public training institutions where welding is being taught.

» «

Apparatus Catalog

An illustrated, 48 page, **1941 Catalog** has been issued by **Victor Equipment Co.** 844-850 Folsom St., San Francisco. There is described the extensive line of gas welding and cutting apparatus manufactured by this organization including: torches, tips, regulators and allied equipment.

Cut open sections of various regulator types and of its major welding torch, in three colors, offer a clear picture of the design and construction features as well as the path which the gases travel through these devices. In addition there is given two pages of data concerning gas pressures and gas consumption of the various torches manufactured by this company.

This catalog will be furnished free of charge, upon request, to any company or individual interested in gas welding and cutting equipment.

» «

American Standards for 1941

The **American Standards Association** have announced publication of a new List of **American Standards for 1941.** In view of the importance of standards and specifications not only for every-day work but to speed up production to meet defense requirements this particular list of standards will be of unusual interest to industry.

More than 400 American Standards are listed, covering definitions, technical terms, specifications for metals and other materials, methods of test for the finished product, dimensions, safety provisions for use of machinery, and methods of work. They reach into every important engineering field and serve as a basis for many municipal, state, and federal regulations. Six hundred manu-

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facturing government and user groups have shared in the development of these standards.

These American Standards, developed as they are by the industrial groups themselves working through the American Standards Association, represent the best in current practice. Provisions are made for their frequent review in order to keep them in line with a changing industrial set-up. Many of the standards listed here were brought up to date within the last year.

This List of American Standards for 1941 will be sent free of charge to anyone interested in the work. Requests should be addressed to the American Standards Association, 29 West Thirty-ninth St., New York, N. Y.

» «

Aptitude Testing and Selection of Men

A 16-page booklet entitled, **"The Use of Ability and Aptitude Testing in Business,"** has just been published by **The Personnel Institute of Chicago,** giving a simple explanation of the scientific plan which is followed by that organization in building "batteries" of tests for all types of sales, executive, clerical and production jobs. Charts are presented illustrating differences in response to these tests by applicants of varying backgrounds and abilities. Aptitude testing is advanced as the modern method of saving a large part of the high cost of hiring and training employes. And according to some of the testimonials included in the booklet, it is as generally appreciated and favored by the applicants, when intelligently handled, as by management. Copies of the study available on request to **Morris I. Pickus,** The Personnel Institute, Inc., 225 N. Wabash Ave., Chicago, Ill.

» «

New Shovel Crane Catalog

A new 16-page illustrated catalog No. 1885 has been completed by **Link-Belt Speeder Corp.,** Chicago, on its 2 to 3 cu. yd. **Speed-o-Matic Series "500" shovels,** draglines, cranes.

Welded unit construction; interchangeable crawler side frames; self-guiding non-clogging treads; self-aligning rotating rollers and center pin bearing; high ground-clearance; and the greater capacity, ease and speed of handling resulting from the machine's hydraulic power control—are among the features pointed out.

Seven pages are devoted to dimensions, clearance diagrams, working ranges, lifting capacities, and brief specifications.

A copy of the new book may be had by writing direct to Link-Belt Speeder Corp., 301 W. Pershing Road, Chicago, or to the company's nearest distributor.

Progress of Victor

"The Story of an Organization" is the title of a booklet recently prepared by the **Victor Equipment Co.,** 850 Folsom St., San Francisco. Packed within its 24 pages is a brief resume of the welding industry and a historical sketch of the Victor Company and the part this organization is playing in the welding industry.

As the foreword states "Nothing would give us more pleasure than to have the opportunity to greet everyone of our customers and prospects in our plants. Since we cannot achieve this, we entrust the story of our organization to these pages hoping that they will convey something of the friendliness and earnestness as well as the completeness of our manufacturing facilities."

The booklet with its many illustrations quite fulfills the thoughts expressed in the foreword.

Recent Patents

Butt-Welding

2,231,014. **Arthur R. Lytle, William Morton,** and **Leonard Spangberg,** Niagara Falls, N. Y., assigned to **Union Carbide and Carbon Research Laboratories,** Inc., New York. Filed Dec. 3, 1938. Feb. 11, 1941. A process for butt-welding members, such as rails, which comprises

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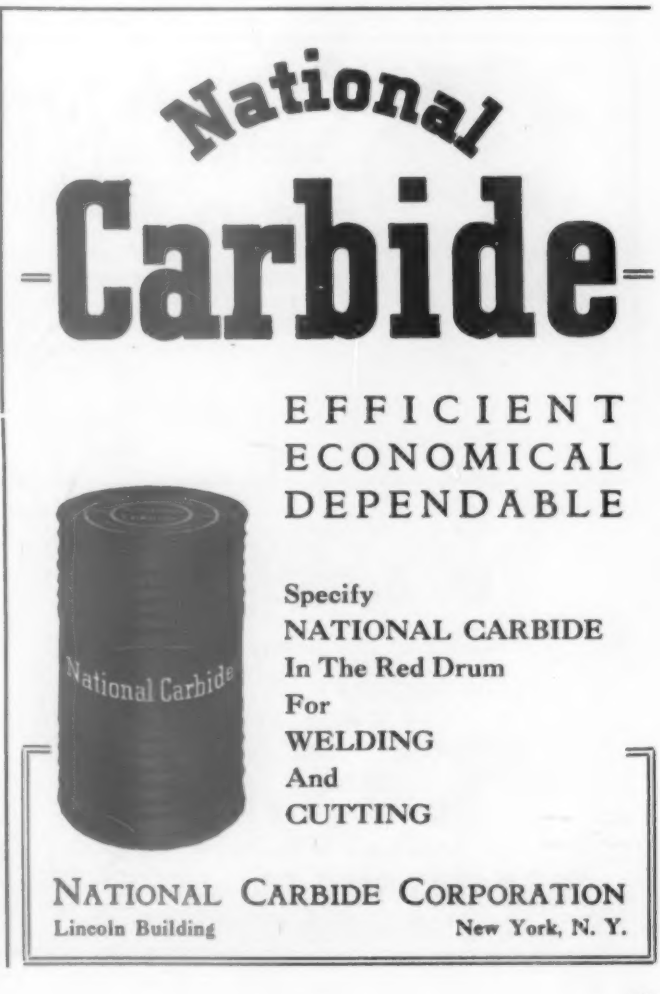

longitudinally aligning the members in abutting relation, forcing the ends together under high pressure while directing upon the abutting ends a plurality of welding flames encircling the members. The flames are reciprocated longitudinally of the members, across the abutting ends along a path of fixed length for a time sufficient to obtain a desired amount of upset at the joint. While the joint is at a high temperature a flame-stripping operation is used to remove the upset metal at the joint. The joint is annealed by the use of reheating flames reciprocated across the joint.

» «

Welding Electrode

2,231,917. **Edward S. Jones,** Birmingham, Ala. Filed Mar. 11, 1940. Issued Feb. 18, 1941. Electric arc welding of cast iron to obtain a weld free of hard spots, blow holes, and expansion cracks, is claimed for a new electrode. The welded part is capable of being machined to the same extent and with the same tools as is the original cast iron. Specifically, the electrode is made up of between 10% to 36% nickel, 8% to 16% copper, and the remainder principally gray cast iron. The weld is strong, shock resisting, and machinable.

» «

Welding Casing Joint

2,232,593. **Samuel E. Diescher,** Pittsburgh, Pa., assigned to **S. Diescher & Sons,** Pittsburgh, Pa. Filed Feb. 1, 1939. Issued Feb. 18, 1941. By the use of an aligning ring having a bore of the same internal diameter as the diameter of the two sections of casing to be welded, an improved welded joint can be obtained. The aligning ring includes a circumferential rib which extends between the ends of the casing sections and which melts during the welding operation. Preferably the ends of the parts to be welded are upset prior to the welding operation. The joint obtained with this core has a smooth internal bore of the same diameter as the bore of the casing body proper. This permits effective use of swab packings in the casing. Provision is made for interlocking the ring and the casing sections.

» «

Welding Stainless Steel

2,232,656. **Frank W. Davis,** Milford, Del., assigned to **E. B. Badger & Sons,** Boston, Mass. Filed Jan. 20, 1940. Issued Feb. 18, 1941. This patent relates to the welding of stainless steel to a ferrous metal of different composition. Due to different carbon contents of the two metals, the properties of the stainless steel may be impaired. Thus there may be a dilution of the chromium and nickel content of the stainless steel as well as a change in carbon content. Moreover, a joint between stainless steel and carbon steel may result in a condition of high stress corrosion susceptibility. The inventor forms a recess in the body of ferrous metal and then deposits in the recess a layer of fused weld metal of stainless steel of low carbon content. The fused layer is hardened and then serves as a layer to which the main stainless steel body is welded. The intermediate layer of modified stainless steel metal minimizes weld stresses due to substantially equal thermal expansion coefficients of the metals being welded.

» «

Welding Control

2,233,617. **David Amphlett Lamb,** Westminster London, England. Assigned to **American Chain & Cable Co., Inc.,** New York. Filed June 1, 1937. Issued Mar. 4, 1941. A photoelectric cell which is responsive to the intensity of the heat or light rays given off by a joint during the welding process is used to actuate a switch for discontinuing welding current. The automatic control is also employed for controlling welding pressure and for terminating cooling of welding dies employed, for example, in the welding of chain links.

» «

Welding Self Hardening Metal

2,233,455. **Louis J. Larson,** Milwaukee, Wis., assigned to **A. O. Smith Corp.,** Milwaukee, Wis. Filed May 21, 1938. Issued Mar. 4, 1941. By the use of an intermediate layer of non-self-hardening metal, a multi-layer shell section of a vessel can be welded to a solid end member even where self-hardening metals are employed in the parts to be welded. The method includes depositing a non-air hardening composition on the weld-

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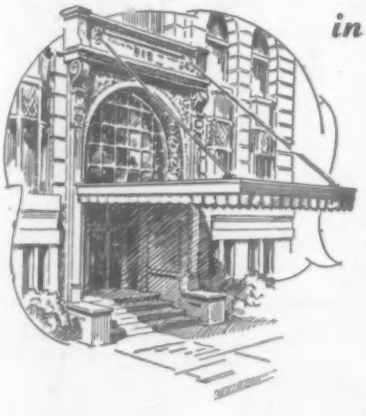

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» «

Electrode Assembly

2,233,897. **Leonard E. Nichols,** Bay City, Mich. Assigned to **National Electric Welding Machines Co.,** Bay City, Mich. Filed April 28, 1938. Issued Mar. 4, 1941. This invention is concerned with welding machines in which the work is placed between a stationary electrode and a series of movable electrodes which are successively actuated to contact the work and simultaneously supplied with welding current. The body of the electrode assembly is made of electrically conductive material to eliminate conventional, flexible conductors used for conveying the welding current to the electrode. The electrode holder is mounted on a piston rod which moves in a hollow section. Fluid pressure is admitted against the piston assembly to force the electrode into engagement with the work.

» «

Electrode Holder

2,233,618. **Harold B. Leach,** Chicago, Ill., assigned to **Electric Arc Cutting & Welding Co.,** Newark, N. J. Filed Jan. 6, 1940. Issued Mar. 4, 1941. In metallic arc-welding, one side of the current supply is brought to the electrode holder, and the other side usually termed the ground side, is connected to the work or piece to be welded. Since prior holders have the portions which grip the electrode exposed, a short circuit might result if the operator, after using up the electrode, should forgetfully lay the welding handle or tongs down or against the work. In addition the operator may get a shock, when he inserts a new electrode, especially if a bare electrode is used. The new safety holder includes a pair of telescopic tubes of suitable insulating material. The electrode is held in suitable fixed and movable jaws. The inner tube has a movable jaw to which current is supplied.

» «

Spot Welding

2,233,526. **Gerhard Hagedorn,** Berlin, and **Walter Hass,** Klein-Machnow, Germany. Assigned to **Bernhard Berghaus,** Berlin, Germany. Filed Sept. 28, 1938. Issued Mar. 4, 1941. An apparatus for double spot or seam welding of two metal sheets by means of two electrodes lying next to one another on one of the metal sheets without any counter-electrodes. A welding transformer is in combination with the two electrodes. The core of the transformer and the electrodes are so arranged that when the iron core is energized by electro-magnetic induction it acts as a current displacer by reducing the current flowing through the upper metal sheet with respect to the current flowing through the lower metal sheet. This effects a weld at the electrode points between the two metal sheets.

» «

Butt Welding

2,234,855. **Frank H. Rehse,** Dayton, Ohio, assigned in part to **Max Isaacson,** Dayton, Ohio. Filed May 2, 1939. Issued Mar. 11, 1941. Tubular pieces of metal are brought into contacting relation while passing an electric current through the pieces to raise the surfaces to slightly less than the welding temperature. One piece is then rotated relative to the other about a common axis while maintaining the arcing relation to flash off the faces into parallelism. The parts are then joined at welding temperature.

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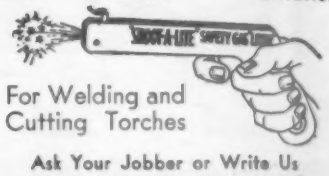

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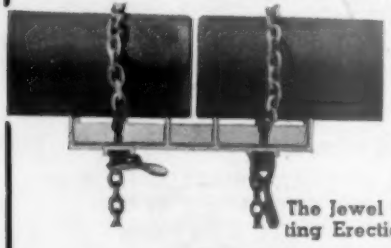

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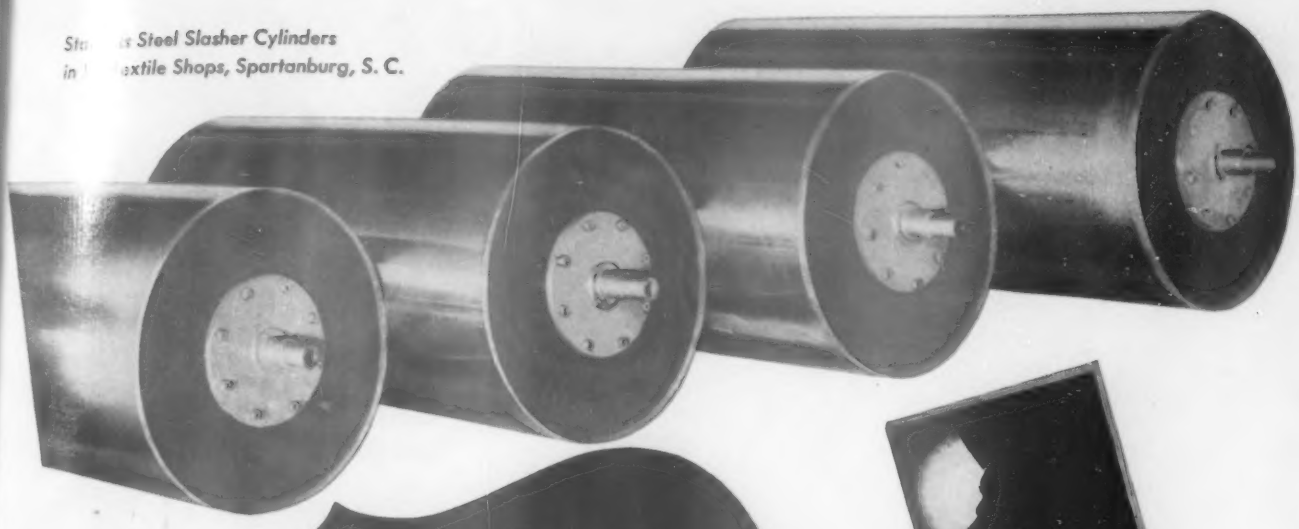

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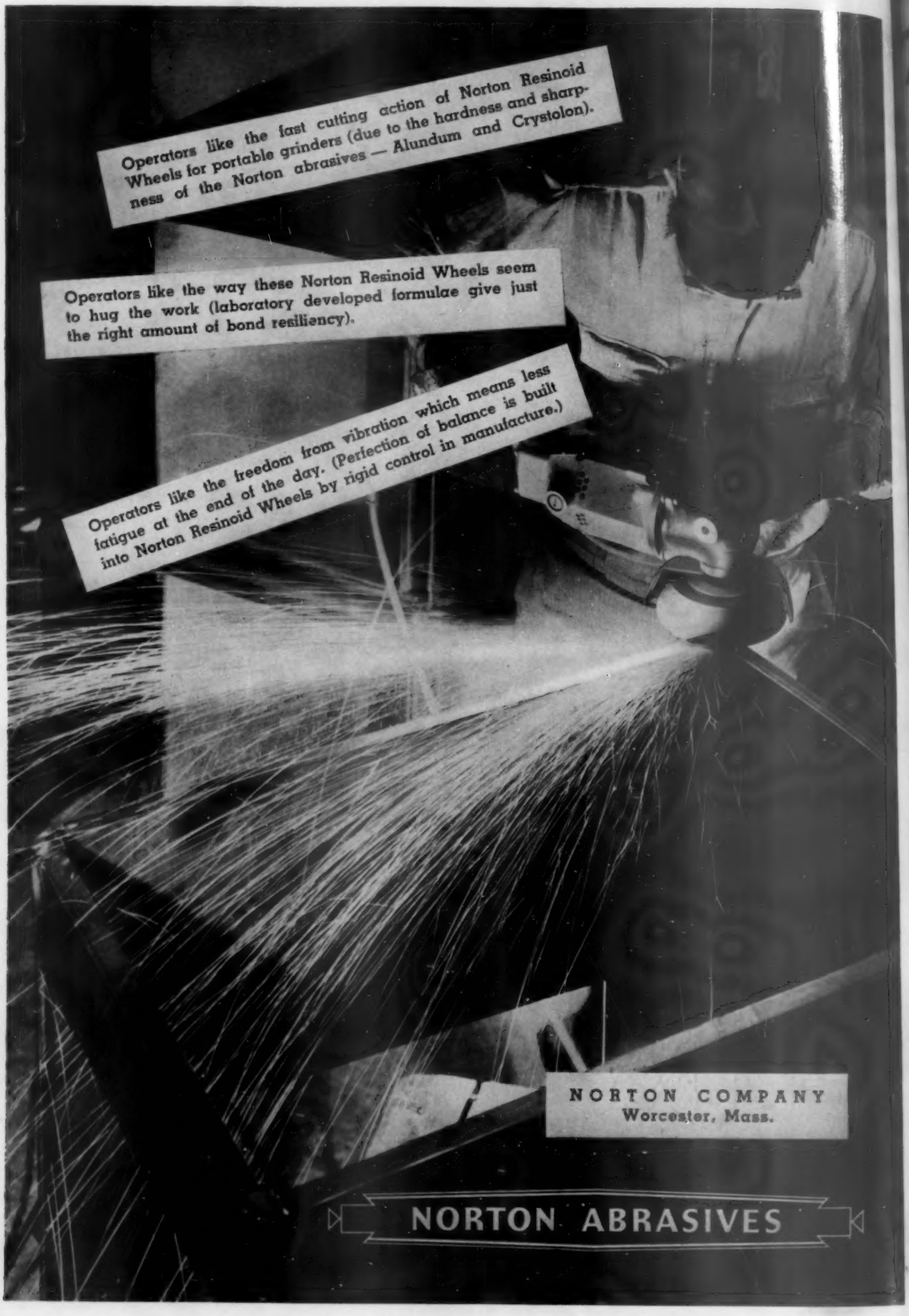
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